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ABSTRACT

Activity plans for fourth grade outdoor education experiences comprise the bulk of this curriculum guide. Many of the outlines have been developed through practical application and experimentation by staff members of the Outdoor and Environmental Education Center (OEEC) of the Harrisburg, Pennsylvania, City Schools. Activities and studies for the late fall are related to vertebrate animals, fruits and seed dispersal, decay, forests, conservation of natural resources, the safe handling of tools, fire building, gardening, and plant reaction to seasonal change. Early spring activities include the study of mammals, arthropods, enemies of the forest, water pollution, land formation, shelters, bait casting, gardening, and animal reaction to seasonal change. Each plan outlines: (1) steps for classroom introduction of the subject and preparation of the students for their outdoor laboratory exercises, (2) information as provided in the OEEC activity, and (3) topics/projects to consider for classroom follow-up and reinforcement. Vocabulary words, films, and books are listed where appropriate as supplemental aids. This work was prepared under an ESEA Title I contract. Related documents are SE 015 164 for grade five and SE 014 707 for grade six. (BL)

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ESEA Title I

Outdoor and Environmental Education Center

Fourth Grade: Late Fall and Early Spring Curriculum Guide

SE 015 163

ED 068367

HARRISBURG CITY SCHOOLS

E. S. E. A. - TITLE I

OUTDOOR AND ENVIRONMENTAL EDUCATION CENTER

FOURTH GRADE
LATE FALL
EARLY SPRING

CURRICULUM GUIDE

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HARRISBURG CITY SCHOOLS

OUTDOOR AND ENVIRONMENTAL EDUCATION CENTER

210 OAKLEIGH AVENUE

HARRISBURG, PENNSYLVANIA 17111

EDITED BY: JOEL ROBERT JACOBS

Curriculum guide photography by JOEL ROBERT JACOBS

HARRISBURG CITY SCHOOLS 1972

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Director of Outdoor and Environmental Education

We fondly dedicate
this curriculum guide to

MR. GEORGE F. BAUMAN

first director of
the Harrisburg City Schools
Outdoor and Environmental Education Center

FORWARD

This curriculum guide is comprised of activity plans, some of which have evolved from originals written by George F. Bauman in 1966, some of which have been penned by staff members of the O.E.E.C. either jointly or individually and some of which have been authored by myself.

Many of the outlines, developed mostly through practical application and experimentation, have been changed, refined, simplified, enlarged and revised for over six years. It is my hope that all of them will remain in a state of flux.

What we have here is a guide, not a bible. In order to be effective it must remain open to criticism, expansion and future editing.

The following people have contributed their time and skills to the creation of this guide either by researching and writing materials for it, or by teaching from activity plans contained within it, or both: E. Arnold Mahey, Lyvonne LeFlore, G. Henry Osborn, Peter M. Hauer, V. Lee Hartwick, Mrs. Connie (Jones) Miller, Dianne I. Martin, Barry R. Patterson, Mrs. Audrey McGahen, Mrs. Mary Houts, and Mrs. Rose Ann Taylor.

Special thanks go to Mrs. Beverly J. Garland, who typed the original manuscript and to Mrs. Phoebe Ann Wilson whose sketches decorate the titles and the seasonal divider pages.

Funds for the operation of this project are made available though Title I of the Elementary Secondary Education Act. I most gratefully acknowledge the aid of Foster M. Brinser, Harrisburg City Schools' Director of Planning for Federal Projects Administration, in procuring the necessary monies to sustain our program year after year.

I am indebted to Charles A. Rosini, Director of the O.E.E.C., and to Benjamin F. Turner, Deputy Superintendent for Program Planning and Development, for their confidence in me.

Lastly, it is due to the faith and insight of Dr. David H. Porter, Superintendent of Schools, that our Center exists at all.

It is both rewarding and satisfying to work for a school district and an administration that allows a concept like environmental education to become a reality.

J.R.J.
March 1972

HISTORY

Outdoor Education began in the Harrisburg School District as a pilot study with fifth and sixth grade groups from Marshall, Riverside, Steele and Melrose. It was staffed by gym teachers and administrative personnel from the art, music and physical education departments among others.

After a successful pilot program, approval was granted for funding under Title I of the Elementary Secondary Education Act in April of 1966. Eight Harrisburg City Schools (Hamilton, Ben Franklin, Downey, Lincoln, Foose, Cameron and Boas) plus four parochial schools (Our Lady of the Blessed Sacrament, St. Francis, Sacred Heart and St. Patricks) began to participate in a fifth and sixth grade program "to stimulate an awareness of the out-of-doors" in children from the city.

The first director, Mr. George Bauman, influenced the program enormously. He originated the seasonal visitation approach which is still being used, and insisted that small group education in a nature studies program enhanced the rewards for both students and instructors.

The program began as one soundly based in plant study and outdoor nature experiences similar to many summer camps, and developed under the influence of its staff, its directors and hundreds of visiting teachers into todays tripartite of science and environmental studies supplemented with outdoor living activities.

Along with the school-year outdoor science program, the district operated a federally funded summer camp on the grounds of the Center. Fifth and sixth graders identified as having a science need or who were from low income families were eligible for the one week, overnight camping experience.

In the fall of 1969 the second director, Major Lorris E. Brown, turned much of the responsibility for curriculum development over to his staff. The instructors immediately began to enlarge the animal studies program which began under Mr. Bauman as a beg, borrow and bag affair with the Hershey Park Zoo lending some birds and mammals.

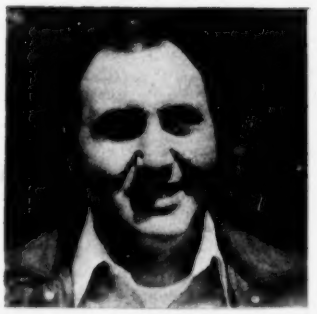
Under the present director, Mr. Charles A. Rosini, animal studies have been further expanded, archery and bait casting have been added to the curriculum, the summer camp experience has been opened up to the third and fourth graders in the form of a day camp, and the early childhood grades (K5, 1st and 2nd) and third grade have been included in the school-year program.

School year 1971-72 saw each kindergarten through third grade child in a city school, both public and parochial visiting the O.E.E.C. for two days and each fourth, fifth and sixth grader visiting for four days. At that rate an individual could participate in twenty days of environmental education in his first seven years of school.

Long range goals include a full kindergarten through twelfth grade program, the expansion of career education in environment in the Harrisburg City Schools, workshops to further integrate the outdoor laboratory experience and curriculum into the regular science program in the schools ultimately resulting in every elementary science teacher becoming an environmental specialist, and the development of a central warehouse at the O.E.E.C. for environmental learning aids which could not feasibly be acquired by every school.

The O.E.E.C. exposes children to learning activities which would be impossible to duplicate within the confines of any city elementary school. The necessity of growing up with these experiences in order to become better citizens of Spaceship Earth is its raison d'etre.

OEEC STAFF



CHARLES A. ROSINI, Director

A 1961 graduate of Pennsylvania State University with a B.S. in Physical Education and Health. He has done graduate work at Syracuse University, P.S.U. and Cortland State and is certified to teach health, physical education, general science and social studies.

He has directed the OEEC since February 1970.

JOEL ROBERT JACOBS,
Curriculum and Staff Development Specialist

A 1965 graduate of Rider College in Trenton, New Jersey with a B.A. in History, he holds his teacher certification from Penn State University in Elementary Education.

He has been with the OEEC since the spring of 1968, and is the editor of the OEECology News, and the Fourth, Fifth and Sixth Grade Curriculum Guides.

MARY D. HOUTS,
Curriculum and Staff Development Specialist

A graduate of Radcliff College, she holds an M.S. in Conservation of Natural Resources from the University of Michigan.

She joined the OEEC staff in September of 1971.

LYVONNE LEFLORE

A 1965 graduate of Jackson State College in Mississippi with a B.S. in Physical Education.

He has been with the OEEC since 1966 except for school year 1968-69 when he was a physical education and health teacher and head basketball coach at John Harris High School.

E. ARNOLD MAHEY

Graduate with a B.S. in Education from Clarion State College in 1956.

He has been with the OEEC since April 1966. He is a past president of the Harrisburg Education Association.

G. HENRY OSBORN

A 1960 graduate of Elizabethtown College with a B.S. in Science.

He has been with the OEEC since the spring of 1968.

PETER M. HAUER

A 1968 graduate of Gettysburg College with a B.S. in Biology, and teacher certification from Shippensburg State College.

He has been with the OEEC since September 1968.

V. LEE HARTWICK

A 1969 graduate of Pennsylvania State University, he has also attended Shippensburg State College and Millersville S. C.

He has been with the OEEC since September of 1970.

BARRY R. PATTERSON

A 1971 graduate of Pennsylvania State University with a Bachelors in Elementary Education.

He has been on the teaching staff here since September 1971.

DIANNE I. MARTIN

After Pre Med. studies at Cambridge University in England, Marteé graduated in 1970 with a B.A. in Biology from Messiah College. She is presently enrolled in a Masters of Education in Biology program at Shippensburg State College.

She has been with the OEEC since the fall of 1970.

AUDREY J. McGAHEN

A 1948 graduate of Allegheny College with a B.S. in Biology with Secondary Education.

She has been a substitute and part time teacher with the OEEC since 1967.

ROSE ANN TAYLOR, substitute teacher.

SARA K. HINTON, teaching aide.

LATAYNA P. TOTTEN, teaching aide.

BEVERLY J. GARLAND, clerk-typist.

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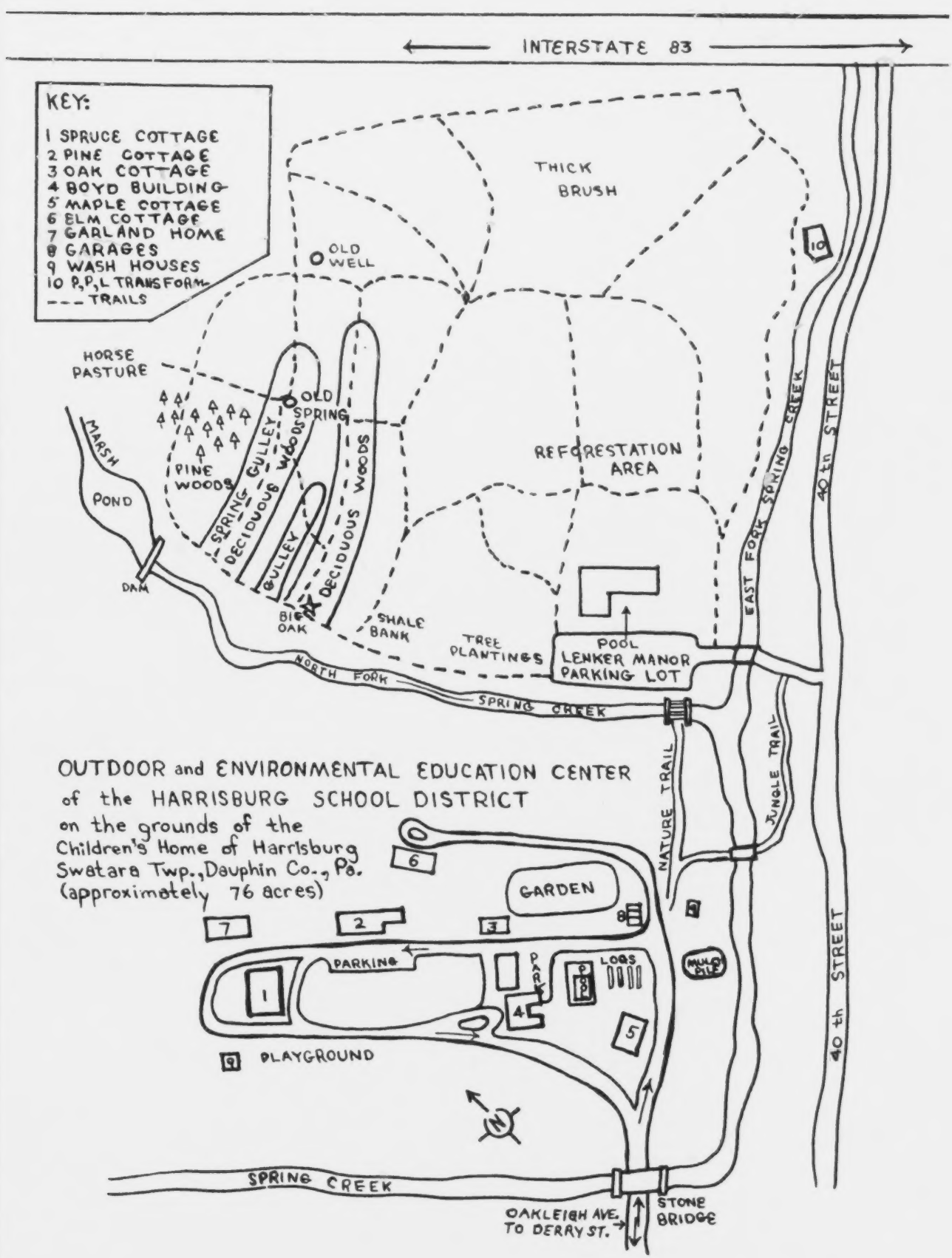

INTERSTATE 83
KEY:
1 SPRUCE COTTAGE
2 PINE COTTAGE
3 OAK COTTAGE
4 BOYD BUILDING
5 MAPLE COTTAGE
6 ELM COTTAGE
7 GARLAND HOME
8 GARAGES
9 WASH HOUSES
10 P,P,L TRANSFORM.
--- TRAILS
THICK BRUSH
OLD WELL
HORSE PASTURE
OLD SPRING
MARSH
POND
PINE WOODS
SPRING GULLEY
DECIDUOUS WOODS
BULLEY
DECIDUOUS WOODS
REFORESTATION AREA
EAST FORK SPRING CREEK
40th STREET
DAM
BIG OAK
SHALE BANK
TREE PLANTINGS
POOL
LENKER MANOR PARKING LOT
NORTH FORK SPRING CREEK
NATURE TRAIL
JUNGLE TRAIL
OUTDOOR and ENVIRONMENTAL EDUCATION CENTER
of the HARRISBURG SCHOOL DISTRICT
on the grounds of the
Children's Home of Harrisburg
Swatara Twp., Dauphin Co., Pa.
(approximately 76 acres)
GARDEN
PARKING
LOGS
MULCH PILE
PLAYGROUND
SPRING CREEK
OAKLEIGH AVE. TO DERRY ST.
STONE BRIDGE
40th STREET

CONTENTS

ADMINISTRATION III

DEDICATION IV

FORWARD V

HISTORY VI

OEEC STAFF VIII

SKETCH MAP OF OEEC XI

CONTENTS XII

NOTES TO THE TEACHER I

LEST WE FORGET 3

FOURTH GRADE: LATE FALL 4

INTRODUCTION TO VERTEBRATE ANIMALS 5
FRUITS AND SEED DISPERSAL 7
DECAY II
FORESTS 14
CONSERVATION OF NATURAL RESOURCES 19
TOOLS: SAFETY AND HANDLING 25
FIRE BUILDING 27
GARDENING: LATE FALL 31
OBSERVATION HIKE:
PLANT REACTION TO SEASONAL CHANGE 33

FOURTH GRADE: EARLY SPRING 37

MAMMALS 38
"BUGS" (ARTHROPODS) 42
ENEMIES OF THE FOREST 46
WATER POLLUTION 50
LAND FORMATION 56
SHELTERS 61
BAIT CASTING 63
GARDENING: EARLY SPRING. 66
OBSERVATION HIKE:
ANIMAL REACTION TO SEASONAL CHANGE. 68

NOTES TO THE TEACHER

HOW TO USE THIS GUIDE

I. Description of activity plans
   A. The activity plans found in this guide are standardized to a point.
   B. Nearly all of them contain a Classroom Introduction, an O.E.E.C. Activity and a classroom Follow-up.

II. Introductory and follow up activities
   A. The introductory activities are meant to prepare the students for their outdoor laboratory experiences.
   B. The follow-up activities reinforce them.
   C. Preparation and reinforcement are necessary if the students are to achieve a maximum benefit from their activities at the Center.

III. Interchanging suggested activities
   A. Some of the suggested activities, can be interchanged between introduction and follow-up and unless otherwise prescribed the teacher should feel free to do so.

IV. Vocabulary
   A. Vocabulary is listed as an aid to the teacher.
   B. It can be utilized in science or language arts classes or in developing your instructional materials.

V. Films
   A. Films available through the Harrisburg City Schools Film Library should be previewed by the teacher.
   B. Films should always be discussed after the students have seen them.

VI. School neighborhood nature walks
   A. Many activities contain suggested themes for nature walks around the home school neighborhood.
   B. It is possible to combine several of these into one walk.
   C. The more properly directed nature walks the students experience the better.

VII. Adjusting home school science curriculum
   A. Since classroom visits are locked into a tight schedule at the beginning of each year and since

our curriculum is woven around seasonal guidelines some of the science offering in the home school may have to be adjusted to coincide with the OEEC experience.

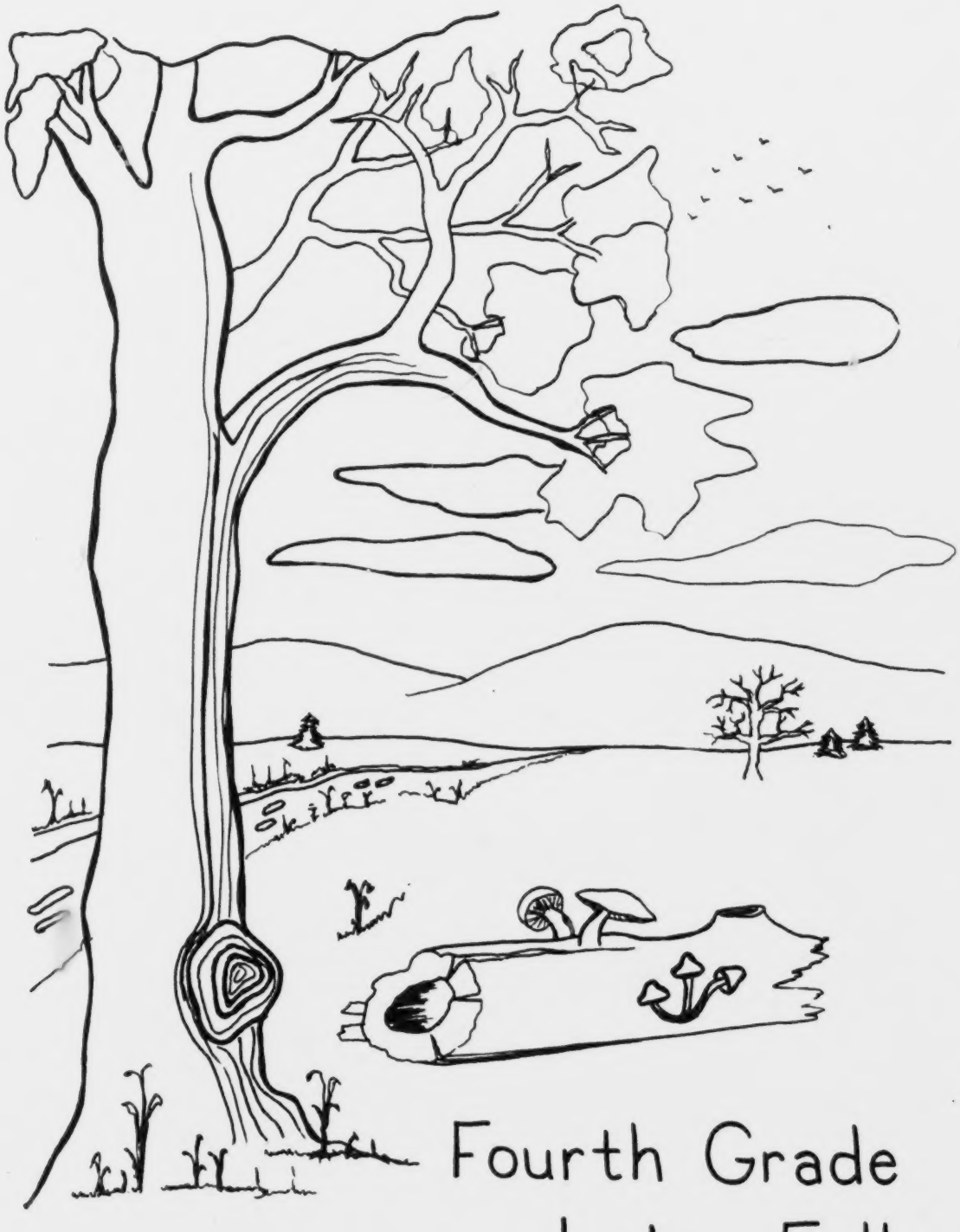
VIII. Interdepartmental coordination
- A. There is a definite need for coordination between the teachers of various subject areas in the home schools so that the children obtain a maximum benefit from their outdoor laboratory experience.
- B. Many activity plans contain suggestions that can be utilized in art, language arts, music and social studies classes.
- C. The specific lack of pencil and paper activities at the OEEC is on purpose.
- D. Language arts work that relates to Center activities should be done in the classroom at school.
- E. Relating concepts discovered at the O.E.E.C. to the urban school-home environment is a necessity whether it be in science or academic classes.

IX. Notebooks
- A. Though no specific instructions will be found referring to notebooks, each child may keep one with all his work concerning the OEEC, or he could have a manilla folder or a large envelope to save his OEEC related school work.
- B. No grade should be given on this notebook or collection.
- C. It should not be carried with the students to the Center.

X. Telephone 564-0200 for eco-help
- A. Members of the OEEC staff are available for consultations with all teachers to aid in implementing this guide.
- B. Arrangements can be made for OEEC staff members to come to your classrooms for special teaching visits.
- C. If you think of a neat idea, and need advice or suggestions to complete it, call us.
- D.. The OEEC will lend you any teaching aid, exhibit or specimen that it is not utilizing for instruction at the time you ask.

XI. The blank spaces opposite the printed pages are provided for notes.

to the children . . .



Fourth Grade
Late Fall

Vertebrate Animals

Classroom Introduction

1. Ask the students to name as many animals with a backbone as they can.

2. Ask the students to bring in any animal backbones they can. Begin a collection. Some students might be able to supply chicken, duck or turkey backbones from their dinner tables.

3. Vocabulary:

Fish	Reptile	Vertebrate
Amphibian	Bird	Invertebrate
	Mammal	

O.E.E.C. Activity

All living things can be split into two groups: plants and animals. Animals unlike plants, are mostly free to move about, they have a nervous system, and their growth is even throughout the body not just at the tips as in plants. Animals feed on plants and other animals. Plants make their own food, or live off of other plants, rarely relying on animals for food.

Animals can be divided into two groups: those with a backbone (vertebrates) and those without a backbone (invertebrates).

The invertebrates include the majority of known animals, from tiny microspic protozoans (one celled animals), to the vast insect kingdom. This group also includes arachnids (spiders, daddy-long-legs), crustaceans (crawfish, crabs, shrimp), mollusks (clams, snails), and a host of others. They will be studied later.

There are five classes, or groups of vertebrates. They are, from simplest to most complex:

1. Fish - Aquatic, they breathe with gills, have slimy scales, and live in both fresh and salt water.

2. Amphibians - They live part of their life in water, breathing through gills, and part as land dwellers who return to the water to lay their eggs. They include frogs, toads, salamanders, and newts. Amphibians usually have smooth, wet skins.

3. Reptiles - They have dry, scaly skin and breathe air with lungs. This class includes turtles, snakes, lizards, alligators, and crocodiles.

4. Birds - The only animal class with feathers. They are warm-blooded, egg layers who take great pains in caring for their young. They have beaks and scaly legs, which scientists believe are remnants of their dinosaur-like, reptilian ancestors.

5. Mammals - People are mammals, as are whales and any other animals with hair. They are warm-blooded and feed their live-born young from milk glands.

It should be noted that fish, amphibians, and reptiles are cold-blooded animals. They acquire the same temperature as their surroundings. Birds and mammals are the only warm-blooded animals. They have their own body temperatures.

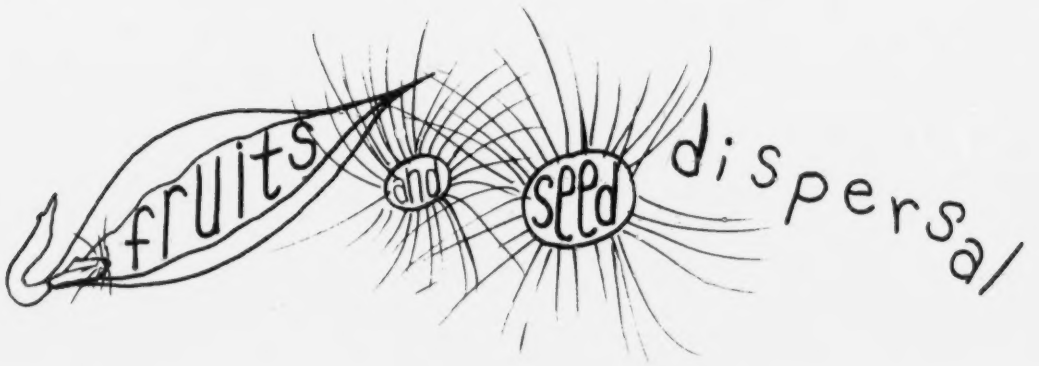
Classroom Follow-up

1. Make a poster for your room naming the five classes of animals with backbones. Find pictures of examples of each class.

2. Obtain food, cage, and a vertebrate animal for your classroom. Have the students take turns caring for it. Study its habits.

3. Discuss which vertebrate animals live in the city.
   a. List these animals according to class, and note whether they are cold or warm blooded. Don't forget Man.
   b. Talk about where in the city each type of vertebrate lives. e.g. parks, street, trees, buildings, etc.
   c. What kinds of food do they eat and where do they find it.
   d. How do they raise their young?

4. A film from the district's film library which will relate to this activity is: "Animals With Backbones," #1156.



Classroom Introduction

I. Understandings - These points must be covered before the children participate in the O.E.E.C. activity in order to make the outdoor laboratory experience meaningful. They can be adequately covered by use of the display and the discussion suggestions which follow.

A. Fruits.
1. Fruits are made up of seeds and an outer covering which varies widely from plant to plant.
2. Their main function is as a receptacle for seed maturation, protection and dispersal.
3. They are produced by flowers.

B. Seeds.
1. Seeds contain embryos or baby plants.
2. Seeds are not necessary to the plant for survival as an individual, but for survival of the species.
3. Seed dispersal is necessary to protect young plants from competition with parent plants and to save the species should a natural calamity occur in the area of the parent plant.

II. Classroom Display - Have a display of seeds and fruits.

A. Found on city streets such as - Horse chestnuts, Sycamore balls, Maple "helicopters," grass and weed seeds.

B. Those bought in stores such as - apples, oranges, tomatoes, peanuts, string beans, walnuts.

III. Classroom Discussion

A. Have your students make a list of all the fruits they can think of - then point out to them that many things we call vegetables are really fruits as are many things we consider inedible, because to a plant scientist a fruit is anything that develops from a flower and contains seeds.

B. Using some of your display samples discuss with the class what kind of protection fruits offer seeds until they are mature. Chestnuts are a very good example of this.

C. Discuss the meaning of the word "dispersal" and how the various seeds in the display are dispersed.

D. Ask the class if seeds are necessary for an individual plant to survive. (You can use the comparison of human beings - do people need children to survive as individuals?) Then what is the advantage of seeds to the plant?

E. Discuss with the class what would happen if seeds were not dispersed, but just fell right under the parent plants all the time. There would be great competition for sunlight and water, and if that patch of seedlings were destroyed there would be no surviving individuals.

F. Vocabulary:
Fruit Seed Mature Dispersal

O.E.E.C. Activity

I. Indoors

A. Discussion of differences in types of fruits and seeds. The class will use the Center's extensive fruit and seed collection - the fruit types discussed will be as follows:

1. Legumes - pods which open along two sides.
   example - peas, beans, Kentucky coffee bean.
2. Follicle - pods which open along one side.
   example - milkweed.
3. Capsule - has a lid-like cover which opens at maturity.
   example - Lily, poppy, iris, horse chestnut.
4. Achene - contains a single seed which nearly fills the cavity of the fruit.
   example - sunflower, buttercup, dandelion.
5. Grain - a one seeded fruit with seed coat fused.
   example - corn, oats, rice, most grasses.
6. Winged-fruit - usually single seeded with"wings" for dispersal.
   example - maple, elm, basswood (Linden).
7. Nuts - one-seeded fruit: thick, hard, stoney.
   example - beechnut, acorn, chestnut.
8. Berry - fleshy fruit. Usually large and fleshy with several seeds.
   example - tomato, grape, citrus fruits.
9. Drupe - a stone fruit, hard woodey "pit" with a single large seed.
   example - coconut, peach, plum, cherry.
10. Pome - has a "core", usually containing several small seeds.
    example - apple, pear, quince.

11. Aggregate fruits - fruits in clusters that develop from one flower.
example - raspberry, blackberry, strawberry.
12. Compound fruits - formed from two or more flower ovaries fused together.
example - pineapple, fig, orange.

B. Discussion of methods of seed dispersal.

1. Wind -
a. Some fruits and seeds are so light and/or small, so as to be easily carried by the wind.
b. Some have special parts to help them in their flight.
example - "wings."
Feather-like structures.

2. Water -
a. Rain may wash seeds to new locations.
b. Seeds may fall into streams.
c. Coconuts float in the ocean from island to island.

3. Explosion -
Often when fruit opens with force, the "explosion" sends the seeds out some distance from the parent plant.
example - beans, poppy, jewelweed.

4. Animals -
a. Seeds or fruits may be carried by birds and mammals on the outside of their bodies, in the form of "hitch-hikers."
example - burdock, beggars tick.

II. Outdoors

A. The group will take a walk to observe different types of seeds, and fruit and seed dispersal mechanisms on plants growing at the O.E.E.C.

B. Examples will include the following: locust, burdock, black walnuts, acorns, Kentucky coffee bean, pine cones, hemlock cones, spruce cones, nightshade and various meadow plants.

C. The instructor will drop a seed of some kind into Spring Creek to demonstrate dispersal by water. He could encourage the students to imagine the destination of that seed and the chances it has to grow there.

Classroom Follow-up

A. Discuss the uses of seeds to man.

1. For planting our food plants.
2. For use as food - peas, corn, lima beans, nuts, rice, wheat etc.
3. For jewelry, and arts and crafts.

B. Try to obtain some exotic fruits and seeds for the class to try eating.
examples: coconuts, macadamia nuts, pomegranates, kiwi fruit, persimmons, mangoes, prickly pears, papayas, chic peas.

C. Films from the District's film library that may relate to this activity include: "How Does a Garden Grow," #1023, and "Plants are Different and Alike," #1105.

Classroom Introduction

Decay is the process of naturally breaking down living matter into its simplest parts.

1. The teacher can lead a discussion on the subject of decay and have children give examples of decay. Use the definition above and expand on it. Below are listed some common agents of decay.

Bacteria	Mildew	Mold
Mushroom	Fungus	Yeast

Other activities that also aid in the total process of decay are such things as weather conditions, especially freezing and thawing, and the chewing up of dead things by insects.

2. Vocabulary:

Humus	Rot	Decompose
Mulch	Decay	Organism

O.E.E.C. Activity

I. The instructor will lead a review discussion of the definition of decay and show samples from the O.E.E.C.'s collection.

A. Some agents of decay.
   1. Fungus - Do not make their own food. Live off of dead matter and other organisms.
   2. Mushrooms - A fungus.
   3. Lichen - A "marriage" of algae and fungi.
   4. Mold - May improve taste as in cheese.
   5. Mildew.

6. Bacteria.
7. Yeasts.
8. Rusts and smuts.

B. Decaying organisms may have the following characteristics.
1. Live off of dead matter.
2. No chlorophyll to make their own food.
3. Produce many spores instead of seeds.
4. Soften and decompose dead matter.
5. Queer taste, but basically harmless in food.
6. No flowers.
7. Odd colors and shapes.

C. Decay is an important part of nature's balance.
1. Nature works in many different balanced cycles. Decay is a part of some of these. As they grow, plants take minerals and other compounds from the soil and air. Animals and other plants transform some of these when they consume the green plants for their food. When all these things decompose, Nature's cycles are completed because the minerals and other compounds are returned to the soil and air.

II. The instructor will lead a tour of the Center's grounds to find examples of decay.

A. Decaying logs.

Many years are necessary for a log to change from a fresh fallen tree to a pile of humus. The materials that formed the log came from the air and the soil. They will be returned to the soil to be used again by other plants.

The length of time required for this decay to take place varies according to the climate. In Pennsylvania it is not uncommon for a log to take 20 to 30 years to completely decay.

Different communities live on decaying wood.

1. Pioneer Community:

A newly fallen log is fresh looking and firm to the touch. It is healthy and smells fresh. Soon it is attacked by insects and other organisms. It becomes darker in color, the bark loosens, and tunnels appear under the bark. Larvae of beetles chew the wood. Slime mold is carried into the tunnels by the larvae, and softens it. Freezing and thawing cause more changes in the log.

2. Second Community:

Years later, snails, fungus, and insects such as gnats and larvae of click beetles appear. They replace the first community. The wood turns soft and moist. The bark, in most cases, is gone.

3. Third Community:

As the wood changes to a pulpy and soft humus, molds and bacteria, become prevalent, and the second community of insects disappears.

4. Climax Community:
   The log finally becomes humus and falls apart. It is now completely rotted wood. Earthworms, millipedes, ground beetles, mushrooms, puffballs, and green plants, such as moss may inhabit the spot.

B. The Mulch Pile
   A heap of decomposing leaves, plants, and other organic matter that goes through the same kind of community succession as the decaying logs. Obvious heat is given off from the pile as it rots.

C. Any dead animal carcass that may be found.

Classroom Follow-up

1. Make a collection of decaying matter and agents for classroom study.

2. Grow your own decay organisms.

   A. Bread mold.

   B. Fruit mold.

   C. Mushroom farms.

3. Have the students look for examples of decay in the school yard and neighborhood. They can look at: window sills; porch steps; and railings, and look for: tree stumps; and dead branches of trees.

4. Have a discussion on how to keep things from decaying.

   A. What do people do so wood won't rot?

   B. Why does what they do keep the wood from rotting?

5. Discuss what materials don't decay and how this leads to disposal problems.

6. A Harrisburg School District film relating to this activity is: "Life On A Dead Tree," #1020.

The objectives of this lesson are to make the students aware of the processes involved in the development of a forest, and how it functions once it matures.

These include:

1. The land where a forest is has undergone many changes before it produced a forest. These stages of growth in the creation of a forest are called forest succession.

2. The soil of a forest is made up of the remains of all the plants and animals that lived, died and decayed there.

3. The floor of a forest is covered with forest litter. This litter is made up of leaves, twigs, seed coverings and other organic materials which decompose to become soil.

4. Living things in a forest must compete for what they need to survive.
   a. Trees compete for water and sunlight.
   b. Animals compete for food and shelter.

5. The roof of a forest is called the canopy. When a hole is formed in the canopy, by a tree dying, young trees participate in a life and death race for the sunlight pouring through the hole. The race is over when the hole is plugged.

Due to the special nature of this lesson, all of the home school teaching will occur as a follow-up to the O.E.E.C. activity.

O.E.E.C. Activity

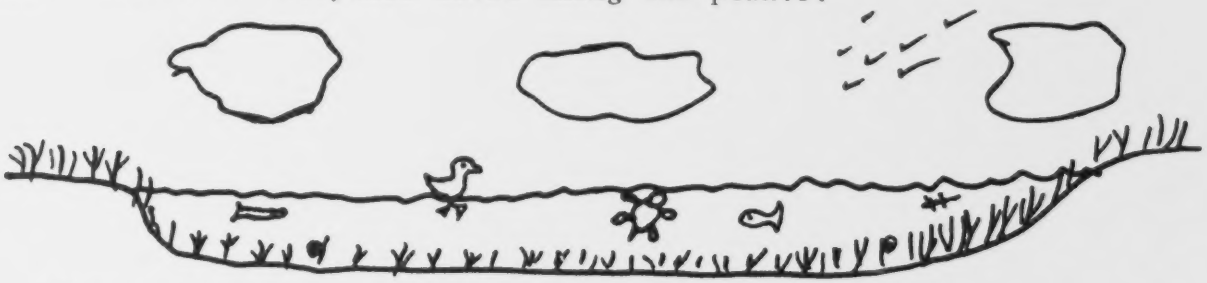
I. The instructor will use the first fifteen minutes of this activity to tell the following story using either a flannel board or a chalk board to reproduce the illustrations.

Every forest has a story to tell about the way it grew. Lets take one forest as an example. Here is its story.

Many years ago there was a lake. It was a fresh water lake fed by a stream. It abounded in life.

There were fish, water turtles, and frogs in the lake and water striders skipping on the surface. There were ducks and geese there too.

At the bottom of the lake many different kinds of water plants grew. Snails and crayfish lived among the plants.



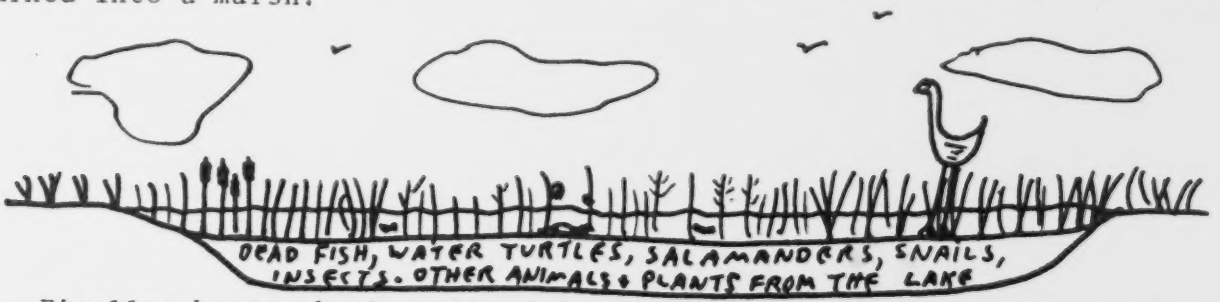
After a long time the stream that gave the lake its water began to go dry.

As the water slowly disappeared the plants that grew along the shallow edges of the lake began to creep toward the center.

At the same time the lake animals either died there or moved away, and the animals that lived in the shallow water plants took their place.

New animals lived there now - Red Wing Blackbirds and different kinds of water birds with long legs so they could stand up in the shallow water and tall grass, smaller fish, new kinds of snails, turtles, frogs,and salamanders, and some bigger animals like muskrats. Even moose, who wallow in the water and eat lilly pads lived there.

Many different kinds of insects were attracted to the new plants. All of these things lived above where the lake used to be. The lake had turned into a marsh.



Finally the creek that supplied the water dried up completely and so no water got into the marsh. Wild flowers and new kinds of grasses and bushes started to grow.

The animal life changed again too. Deer visited there. Field mice burrowed in the grasses, ground hogs tunneled into the ground, rabbits scampered around and foxes hunted all three.

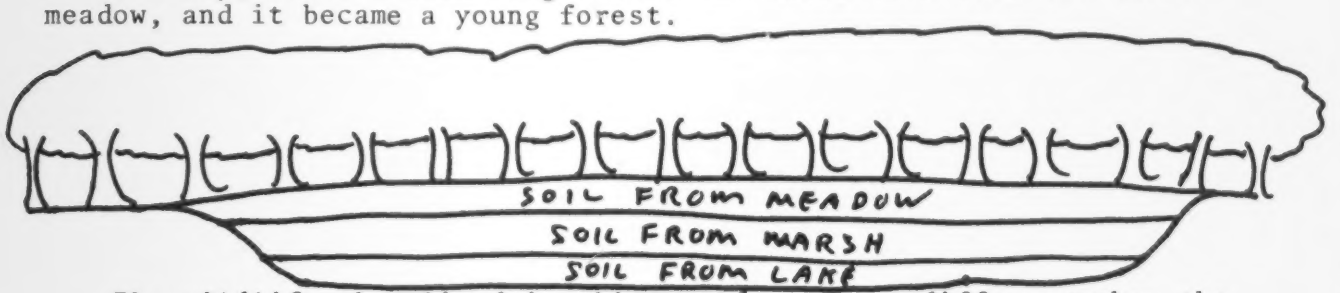
Birds like Pheasants, Sparrow Hawks, and Meadow Larks flew there to live. Many different insects like grasshoppers, crickets, and butterflies made their home there.

This all happened above where the marsh used to be, which was above where the lake used to be. The marsh had turned into a meadow.

Near the meadow, in several directions, there were many different kinds of trees. When the wind blew across the meadow some of the seeds from these trees were carried through the air and dropped onto the meadow. They began to grow.

Years later some of these new trees grew big enough to drop their own seeds. Clusters of trees appeared in different parts of the meadow, where they towered over the grass and bushes. New kinds of birds flew in to nest in these trees.

Finally, after a much longer time the trees took over the whole meadow, and it became a young forest.

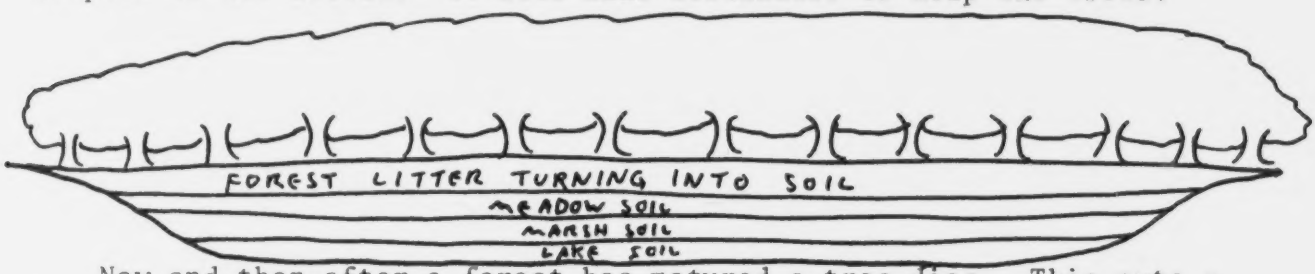


The wildlife that lived in this new forest was different than the wildlife of the meadow. Deer, mice, rabbits, and foxes still lived there, and other bigger animals like bear, elk, and cougar.

Skunks, wolves, opposums, racoons, squirrels, chipmunks, and porcupines were moving in too. Woods turtles, box turtles, and toads were there now. Spiders and daddy-long-legs, and locusts, mosquitoes and other woods insects thrived.

Every year the forest grew bigger. The trees grew very large. Each autumn the leaves would fall off the trees, and land on the ground below. These leaves would rot and become part of the soil below the trees.

Small twigs, seed coverings, leaves, bark, dead branches and animal deposits are called forest litter. This kind of litter is very helpful to the forest. It acts like fertilizer to help the trees.



Now and then after a forest has matured a tree dies. This puts a hole in the canopy or roof of the forest, and allows sunlight to shine onto the forest floor.

All plants need sunlight to help make their food. The plants on the forest floor take part in a life and death race to fill up the hole in the canopy. The winner of this competition lives, the others will probably die.

The dead plants, like the tree that died, fall over and in a few years they decay and become part of the soil.

The forest takes minerals from the soil which is made up of the dead things from the lake, the marsh, and the meadow, and replaces those minerals from dead parts of itself. If nothing changes the forest could live like that forever.

II. After the story has been told the instructor will lead his group into the forest bordering Spring Creek at the O.E.E.C. There he will be able to show the students the following things which were mentioned in the story.

A. Forest litter.
   1. Freshly fallen leaves will be evident on the forest floor.
   2. By clearing the new leaves from one spot the instructor can show the students the decomposing leaves which fell the year before.
   3. By removing the second layer of leaves the students can examine the soil below which is made up of fine pieces of decomposed leaves and other things like pieces of twigs, insects, roots, snail shells, grains of sand and the like.

B. Trees that have bent in an effort to reach for more sunlight.

C. Openings in the canopy and the plants growing there.

D. Signs of animals.

E. The level of the water table (Spring Creek).

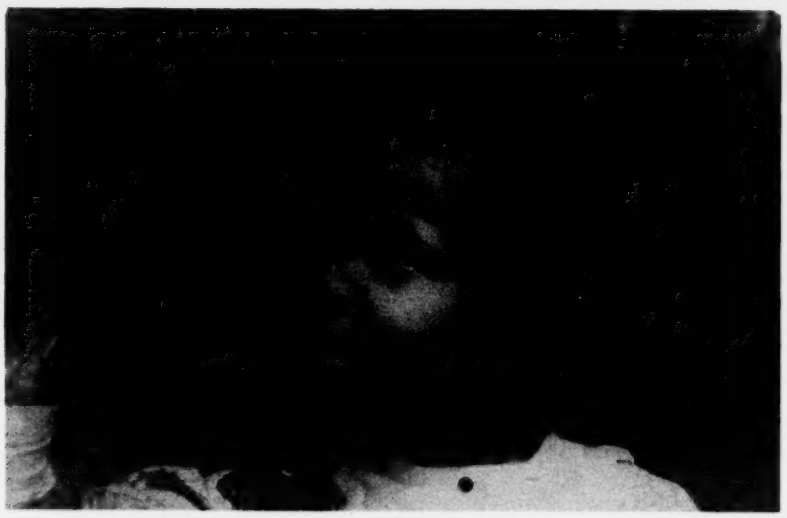
F. Stages of growth in different parts of the forest. Forest succession will also be covered during the observation hike where the students will be able to see where a lake has turned into a marsh, and where that marsh is beginning to turn into a meadow.

Classroom Follow-up

1. Have the students retell the story part of the O.E.E.C. lesson. Pretend that you have not heard it or read it before and they must teach you about the forest and how it grew. Let them take turns narrating and drawing the pictures of lake, meadow, marsh, and forest on the chalk board. Have them draw the forest succession story in four separate pictures across the board. Use arrows between pictures to show time spans. Leave a fifth space. As the story is retold picture by picture write the names, or have the students write the names of all the animals and plants they can think of that would live in each stage. After the story is completed draw an arrow from the fourth picture to the fifth space. Chalk a giant question mark in the fifth space. Ask the students, "What can happen now?" This can lead into the spring lesson called "Forests: Friends and Enemies." You can erase the question mark and list as the children name things like fire, insect enemies, lumbering, picnic area, hunters, campers, lightening, earthquake or whatever. Every item should be followed by a question mark.

2. Vocabulary:

Succession	Meadow	Mature
Marsh	Canopy	Competition



Conservation of Natural Resources

Conservation Pledge

I GIVE MY
PLEDGE AS AN AMERICAN
TO SAVE AND FAITHFULLY TO
DEFEND FROM WASTE THE
NATURAL RESOURCES OF
MY COUNTRY — ITS SOIL
AND MINERALS, ITS
FORESTS, WATERS,
AND WILDLIFE

Classroom Introduction

1. Write the conservation pledge on the chalkboard. Discuss it.

2. Using your school library have the students research the word "Conservation."

3. Explain the term "Natural Resources." Discuss how they are used.

O.E.E.C. Activity

I. The first part of this activity will be spent on the following story taken from the Audubon Nature Bulletin, number 6M-6/'65 published by the National Audubon Society, 1130 Fifth Avenue, New York, N. Y. 10028.*

OUR BROTHERS, THE TREES A Flannel Board Story About Conservation by DOROTHY A. TREAT Formerly Director, Aullwood Audubon Center, Dayton, Ohio.

"Our Brothers, the Trees" is an illustrated story. The narrator illustrates it with cutouts which he places on a flannel board as he tells the story. Whenever words printed in CAPITAL letters occur, the cutout the word represents is to be placed in position on the board. Any other essential instruction appears in parenthesis where needed.

THE STORY

Once much of our land was a beautiful forest. SUGAR MAPLES grew in it - so did the OAKS, HICKORIES, WALNUTS, BEECHES and CHESTNUTS, ASH trees grew there, WILLOWS, BIRCHES, PINE and FIR - and many others besides.

Many animals lived in the forest. It was their home. DEER lived there and BEAR, TURKEYS and HONEY BEES - and many, many more.

ONE day a young Indian boy named RUNNING DEER was playing in the forest. He had always been told that the trees were his brothers, that the same life that was in them was in him, and that each had a gift for him. According to an Indian legend,** the Tree People were here before the Indian Children. When the children came, the Tree People welcomed them. They were glad the children had come. Each tree wished to offer a gift that would help them to live.

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* Reproduction of "Our Brothers, The Trees" is by special arrangement with the National Audubon Society.

** This legend has been adapted from "How the Tree Brothers Gave," a chapter in "Around An Iroquois Story Fire," a children's book by Mabel Powers.

The Maple was the first and gave Running Deer a wonderful BOWL shaped from its wood. The bowl was filled with sweet maple sap for the boy to drink. The White Oak gave him ACORNS and a pounder to grind them into flour. There were NUTS from the Hickory and Walnut. The Beeches and Chestnuts opened their PRICKLY BURS and offered him their nuts. To gather the nuts the Ash gave him a BASKET made of splints from its flexible wood, and a fine strong BOW to shoot his arrows. The Pine gave him poles for his LODGE. The Willow showed him where to find WATER, for it likes to grow beside it. The Birch gave him a BARK CANOE to carry him over the water. The Fir tree gave him two rubbing sticks with which he could make FIRE. Then all the trees in the forest offered him wood for fuel.

Running Deer believed that the animals, too, were his brothers. They gave him meat, skins, furs and feathers. The bees gave him their honey.

All lived together in the forest. Each took what he needed and left the rest. Each one helped the others and helped the Earth that supported and watered him. Even in death, they continued to help - dead trees made homes for insects and woodpeckers, added humus and minerals to the soil.

One day a fine BIG SHIP with beautiful sails came from across the sea. In it were men who wanted a home and needed many things. They needed -
- wood for HOUSES and the furniture to go in them
- wood for fuel
- wood for PAPER -

They needed fields to grow their crops. They CHOPPED (add axe) down trees to make the fields bigger. More and more people came and they needed more and more of everything. They needed MEAT, they needed WATER. More people came and they needed more and more and more. They needed wood for rayon, for plastics. Every day more and more people were born. People lived longer and longer and more and more people came.

(In the following paragraph Soil is presented by a tan ring, Water by a blue ring, Plants by a green ring, Wildlife by a red ring. In the second sentence, the word "more," is represented by a plus sign placed in center of appropriate rings.)

MAN is getting very worried. He needs SOIL and WATER and PLANTS and WILDLIFE. Every day he needs MORE Soil, MORE Water, MORE Plants, and MORE Wildlife - but - (remove plus signs and substitute minus signs for words, "LESS" and "FEWER") every day he has LESS Soil. LESS Water, FEWER Plants, and FEWER Wildlife. What is he to do?

It has been a long, long time since the little Indian boy roamed in the forest and believed the Plants and Animals were his brothers. Man has forgotten how all lived in the forest together and helped each other. Some people have never even heard this story.

When Man kept needing more and more it often happened that the

Soil, the Water, the Plants and the Wildlife became separated and could no longer help each other. The Soil BY ITSELF (remove minus sign) blows away in the wind and washes away in the rain, washes all the way to the sea. The Water BY ITSELF (remove minus sign) runs away too and runs all the way to the sea. Without Soil and Water the PLANTS (remove minus sign) cannot grow. Without Plants, the WILDLIFE (remove minus sign) have neither food nor homes, and Man finds it harder and harder to get what he needs.

(Note: Each ring has an opening-a cut through it-to permit linking them in the part to follow.)

But look! If we put Soil and Plants together (link Soil and Plant rings) the Soil cannot wash away and together the Plants and Soil can catch the rain and snow (link Water ring to other two) and store it in the ground. The Water follows the plant roots down deep in the Soil. With good Soil and Water the Plants can grow and make food and homes for the Wildlife (link Wildlife ring to other three). Then the Wildlife can help the Plants make seed and help to till the Soil. Not one of these four can live by itself, but together they make a fine team.

But the Indian legend is true, Plants and Wildlife are Man's brothers and there is a place right here for Man. (Place man in animal ring.) Man is an animal too.

II. The instructor will then read and discuss the conservation pledge with the students. The discussion will be guided toward the way the students can help follow the pledge.
   A. Soil.
      1. Plant grass, flowers, vines, shrubs and trees on bare, eroding spots.
      2. Don't litter.
   B. Minerals. Coal, gas, and oil in particular.
      1. Turn off electricty and appliances when not needed.
      2. Keep the heat in your house at a low but comfortable level.
      3. Walk, when possible, instead of using a car.
   C. Forests.
      1. Protect forests from campfires. Bring a cold lunch on a hike.
      2. Write letters to save areas from lumbering operations.
      3. Save trees from being cut by saving newspapers, and cardboard boxes, and selling them to scrap dealers for recycling.
      4. Don't waste paper. Write on both sides. Save unused parts for scrap paper.
      5. Don't pick forest wildflowers.
      6. Hike on trails.
      7. Don't bend or break saplings or tree branches.
   D. Waters.
      1. Repair leaking spigots.
      2. Take a fast shower instead of a bath.
      3. Turn off water while brushing teeth.
      4. Use washing soap or detergents without phospates.
      5. Don't throw litter anywhere. It all washes into water.

E. Wildlife.
   1. Don't destroy animal homes by kicking them, knocking them over, rolling over logs, throwing stones at them, running bikes and snowmobiles through their homelands.
   2. Write letters to save areas from being bulldozed and turned into houses, roads and factories.
   3. Leave animals in their habitats.
   4. Think about the rationale of hunting.
   5. Feed birds in winter.

III. The instructor will then take the students on a tour of the grounds of the O.E.E.C. to show the students some good and bad conservation practices.
   A. Soil.
      1. Soil erosion preventive techniques have been used in many places.
         a. There is grass growing on the sloping yard between Pine Cottage and Oak Cottage.
         b. There is a stone wall holding back soil between Pine and Oak.
         c. There are shrubs and macadam beside the steps going up to the rear of Pine.
         d. There are terraces between Pine and Spruce Cottage.
         e. There are Honeysuckle vines on the steep banks around Oak.
         f. There are small trees planted between Oak and the garage.
      2. Litter.
         a. There are many litter barrels on the grounds.
         b. Groups carry bags or buckets on hikes to pick up refuse.
   B. Minerals.
      1. Instructors always turn off the electricty when they leave a room or when it is not needed. We save on the electric bill that way and reduce the amount of coal used at electric plants. This also cuts down on air pollution.
      2. The windows are kept closed when the heat is on. This cuts down fuel consumption.
   C. Forests.
      1. We cut down Elm trees that have the bark beetle blight to control the spread of the disease.
      2. We plant new trees to replace removed ones.
      3. We plant 2,000 trees a year for reforestation and erosion control.
      4. There is a forest management project along our "Jungle Trail."
      5. We choose our firebuilding sites carefully to protect trees, shrubs, grass and buildings from possible fires, and we use cinder block fireplaces for our outdoor cooking classes.
   D. Waters.
      1. Spring Creek is polluted. The Water Pollution lesson scheduled as a fourth grade spring activity covers this subject extensively.
      2. The difference between man's litter and nature's litter can be seen almost anywhere along the creek.
   E. Wildlife.
      1. Most of our Zoo animals are tame pets. Some have been found hurt and we cared for them. Some stay in the animal room for a short time and then are released.

2. We try to preserve their homes by walking around them and build new places for them to inhabit as in our forest management project.
3. There are several bird feeders on the grounds which are maintained all winter.

Classroom Follow-up

1. Discuss the following phrase. "Conservation is not enough - The thing that is needed is love." See how many words the students can think of to replace the word "love." Examples: education; respect; knowledge; preservation; and hope.

2. Teach your students the following song and then sing it in class or during assembly period. Suggest that the music teacher work with it.

THIS LAND IS YOUR LAND*

Refrain:
This land is your land, This land is my land
From California to the New York Island
From the redwood forest to the Gulf Stream waters
This land was made for you and me.

Verse 1
As I was walking that ribbon of highway
I saw above me that endless skyway
I saw below me that golden valley
This land was made for you and me.

Verse 2
I've roamed and rambled and I followed my footsteps
To the sparkling sands of her diamond deserts
And all around me a voice was sounding
This land was made for you and me.

Verse 3
When the sun comes shining as I was strolling
And the wheatfields waving and the dust clouds roll
As the fog was lifting a voice was chanting
This land was made for you and me.

3. Discuss what happened to the soil, minerals, forest, water and wildlife that used to be where your school building is now.

4. Take a walk around your school. Discuss the good and bad conservation practices you notice concerning soil, minerals, forests, water and wildlife.

5. A Harrisburg School District film which relates to this activity is:
"Conservation For Beginners," #1122.

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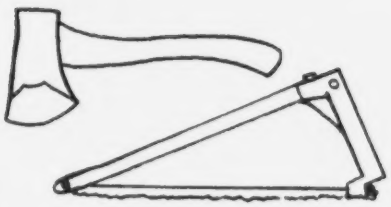
* Permission granted for "This Land Is Your Land," words and music by Woody Gutherie, by TRO-Ludlow Music, Inc. - BMI.

TOOLS

Safety & Handling



Classroom Introduction

1. Collect pictures of as many different tools as you can for a tools bulletin board.

2. Discuss how man's civilization has advanced along with his skill in tool making.
   a. Stone age tools.
   b. Iron age tools.
   c. Modern tools.

O.E.E.C. Activity

This activity is an introductory lesson emphasizing the safety and handling of tools.

I. Points the instructor will stress during this activity.

A. Always choose the correct tool for each job. Tools were designed to do specific jobs. Trying to make another tool suffice can easily lead to damage of the tool... and the worker!

B. Carrying tools correctly is important. Most tools should be carried with the hand near to or grasping the working part of the tool. The working part is usually the heaviest part and so the least amount of effort is expanded when it is carried there. In addition, a sharp tool is best controlled, in case of stumbling, if it is held by the working end. The handle is usually held only when the tool is actually in use.

C. Passing a tool from one person to another can be dangerous. The tool should always be held by the sharp end with the handle extended to the person receiving the tool. In the case of a two-handed tool such as an ax or sledge, both persons should grab the handle. The tool should not be released until the receiver says the words "Thank You." Never try to pull a tool from another's hand!

D. Using tools safely is a matter of common sense. The worker's hand should be empty except for the tool actually in use. Before using a tool, the worker should make sure he, or those around him, are not going to be hurt through carelessness.

II. Demonstrations and activities.

A. With the students the instructor will tour the tool room at the OEEC pointing out to them the proper way to store tools.

B. The instructor will demonstrate the proper ways to carry, pass, and use both woods tools and garden tools.

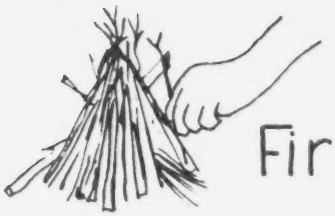
C. The students will practice carrying and passing tools.

D. The instructor will demonstrate the contact method of splitting wood to make tinder, and then let each student practice it. A chopping block will be provided for this demonstration.

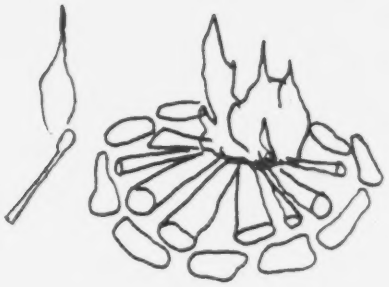
Classroom Follow-up

1. Discuss what your students learned about tools at the O.E.E.C.
   a. Carrying them from one place to another.
   b. Passing them from one person to another.
   c. Using tools safely.
   d. Using the right tool for the right job.

2. Bring in a box of mechanics tools.
   a. Show the tools to your students. First let them guess and then describe the job they're used for.
   b. Discuss safe carrying and handling of the tools.
   c. Send the tools around the room making sure your students pass them safely.
   d. Discuss the proper way to store them.

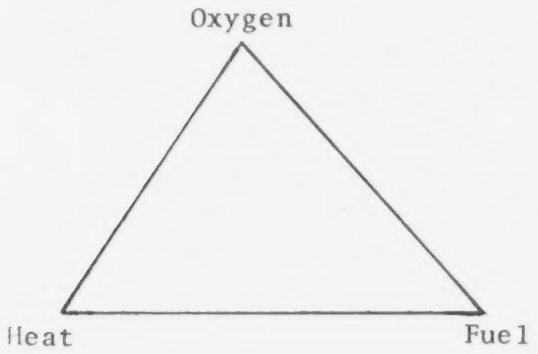


Fire Building



Classroom Introduction

1. It is necessary that the students understand the fire triangle.



   a. In order to have a fire there must be a combustible material (fuel), oxygen, and enough heat to raise the fuel to its kindling temperature.
   b. A fire can be put out by removing any one of the three parts of the triangle.

   Experiments
   1. Light a candle. Blow it out. Discuss.
   2. Light two candles. Put a jar over one of the burning candles. Discuss the results.
   3. Light a candle. Hold a sheet of paper two feet above the flame. Lower the sheet slowly until it ignites. Discuss.
   4. Try to light a large piece of wood with a match (use a section of 2" by 4"). Then light a thin piece of tinder. Discuss.

2. Have your students list ways in which fire is useful to them.

O.E.E.C. Activity

This activity will take place at "The Logs" an area where telephone polls have been set up on split stumps to form a kind of amphitheatre.

On rainy days the back porch of Oak Cottage will be used because it has a cement floor.

If the weather is particularly foul, the fireplace in Spruce Cottage will be used.

Objectives:

To have each small group of students build and light a fire which could be used for warmth or cooking.

This is a success oriented activity. Ideally every student will be able to warm his hands, and each group will be able to make some popcorn on the fire they have built.

Safety Principals:

1. The area must be cleared of leaves and other forest litter which could ignite by accident.

2. A bucket or buckets of water should be provided in case of emergency.

3. Chopping blocks, if needed, will be at safe distances from one another.

4. Axes, if needed, will never be left on the ground but will be implanted firmly in the chopping blocks when not in use.

5. The wood for a fire should be collected and stacked in piles of appropriate size before the actual fire building takes place. Once a fire is lit it is a mistake to leave it to find wood to keep it going.
   a. The wind could cause a forest fire.
   b. The fire might go out.

Procedure:

1. The instructor will first demonstrate the building and lighting of a fire.
   a. The A-frame fire is usually the easiest fire to build and to light, however, the weather conditions will dictate the type of fire to be utilized.
   b. It is important that the students learn the safe way to strike a blue tip match so that it doesn't break or burn their fingers, and the proper way to hold the lit match to take full advantage of the heat it gives off.

2. Each class will be divided into small groups of two or three and assigned a separate spot to build their fire.
   a. Tinder split in the "Tools Safety and Handling" class will be used in order to save time, but if necessary the instructor will give one axe to each group to split tinder on the chopping blocks provided, or to cut up larger pieces of firewood. Most of the larger pieces will have been collected and piled at the site by groups working on gardening activities.
   b. Some tinder and kindling will be collected at "The Logs." This wood, which fell off the surrounding trees, is there for the finding.
   c. After their fire is constructed, each group will call the instructor to their spot for him to examine it. Upon determining that the fire is lightable the instructor will give the group two blue tip matches. If the fire cannot be lit with two matches, it should be rebuilt because the wood used was probably either too wet or still green.
   d. Once the fires have been lit and the popcorn popped the instructor will first demonstrate how and then help the students to extinguish them.

Classroom Follow-up

1. Bring some tinder, and some clean and neatly cut fire wood or logs of about two feet in length and 1/2", 1" and 2" diameter into class and have a firebuilding activity. Let the students show you what an A-frame fire is, then have groups build other types of fires like the Criss Cross or Log Cabin fire, The Star or Indian fire, the Crane fire, and the Reflector fire. Use the Boy Scout Field Book for reference.

2. Discuss the fire precautions used by your school.

3. Have every student draw a floor plan of their home and determine fire and emergency escapes routes.

4. Order the following films from the District's film library for viewing by your students. Discuss them.
   "The Fire Triangle," #269.
   "Firehouse Dog," #150.
   "Safety With Fire," #1137.

4. Discuss what a fire extinguisher is and why it extinguishes. Bring some in to look at and discuss. Take the class outside, light some rolled up newspaper, and see if the extinguisher works.

6. Visit the nearest firehouse.

7. Invite a fireman in to talk to your classes.

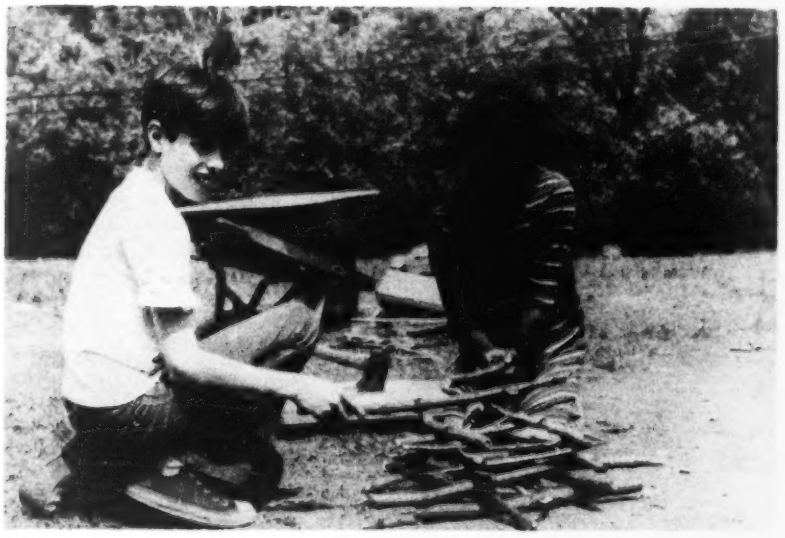
8. Discuss fire safety in the home.

9. Explain spontaneous combustion and the precautions to avoid it.

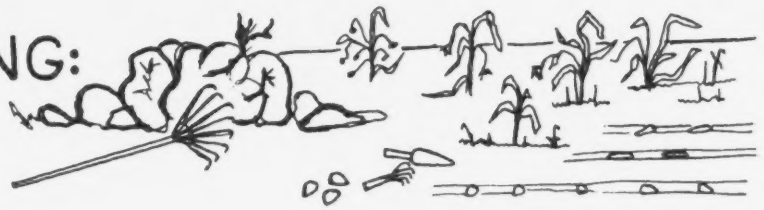
10. A good pamphlet for student use is, "Junior Forest Ranger Handbook," by Glenn A. Kovar. Introduced by Smokey the Bear, it is a fun&games learning book which teaches the children about forests, fires and fire prevention. Printed by the U. S. Government Printing Office: 1969, #0-365-879.

11. Vocabulary

Tinder	Flammable
Kindling	Inflammable
Extinguisher	Combustion



GARDENING:
Late Fall



Classroom Introduction

1. Empahsize that gardening and landscaping require much planning and effort. Take a walk around your school building and the surrounding neighborhood. Take time to observe and discuss vegetable or flower gardens you see and any landscape gardening you find around houses, yards and your school building.

2. Gather pictures of flower and vegetable gardens and landscape scenes for a display board.

3. Collect seed catalogues. Have your students look for vegetables and flowers they can identify.

O.E.E.C. Activity

For many of our students this activity will provide them with their first opportunity to use any kind of garden tool, so safety will be stressed.

One important point the instructor will make is that these tools can be used to change our environment and that it is up to the tool user to decide whether it will be in a damaging or constructive way.

Late Fall Gardening Activities.

1. Landscaping gardening

   The care and planning of lawns, hedges, ornamental trees and shrubs, may be done throughout the year. In the fall many things may be done:

   A. Grass given final trim.

   B. Hedges cut and trimmed.

   C. Trees pruned and transplanted.

   D. Leaves raked.

   E. Lawns seeded and limed.

F. Weeds and trash removed along walls, roads and hedges.

G. Mulch pile maintained.

2. Flower gardens
These need care throughout the year also. Before the ground freezes in the late fall many things will be done.

A. Tulip bulbs and crocus corms may be planted, thinned and transplanted.

B. Iris may be thinned and transplanted.

C. Annuals may be removed.

D. Flower beds should be weeded, mulched and fertilized.

3. Vegetable gardens
These should be given minimal care to prevent erosion damage.

1. Weeds should be removed before they reseed themselves.

2. Herbaceous annuals should be mulched for ground cover.

3. Lime may be applied in fall.

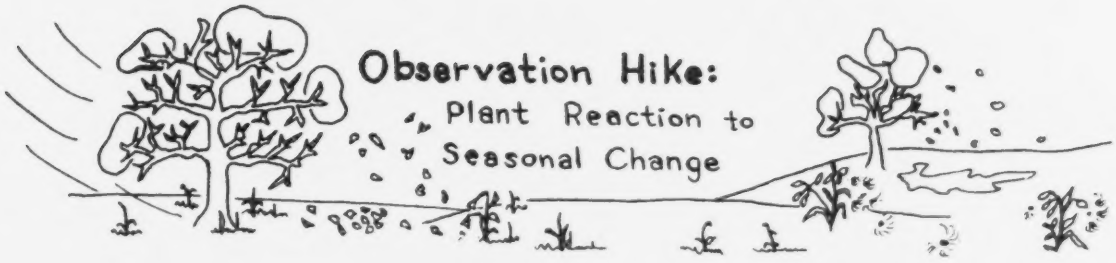
4. Fertilizer may also be applied.

Classroom Follow-up

1. Discuss with your students the common flowers which are planted using seeds, bulbs, corms, bushes, and tubers.
   a. Start plants with examples of each.

2. Make a collection of plants in the classroom.
   a. Grow a sweet potato wall vine, plant grapefruit seeds, or start carrot tops.
   b. Record your observations.

3. A Harrisburg School District film you may order for your students is, "Lets Visit A Tree Farm," #1123.



Classroom Introduction

1. Concepts to be understood prior to the O.E.E.C. visit.

   I. Living things must adapt or adjust to their environment in order to survive.
      A. The seasonal change in temperature and day length are important factors in the environment of living things in Pennsylvania.
      B. Different plants have different ways of adapting to these seasonal changes.

   II. Plants may be classified into three categories, depending upon their life spans: annuals, biennials and perennials.
      A. Annuals are plants that live for only one year.
         1. They produce seeds in the summer which live over the winter although the plants themselves die in the autumn.
         2. The seeds germinate in the Spring, producing new plants. Examples: petunias, marigolds, morning glories.
      B. Biennials are plants that live for only two years.
         1. The first year they produce no seeds, but store an extra amount of food in their roots.
         2. When winter comes, usually everything but the root dies.
         3. The next spring new stems and leaves come up from the roots. During this second year flowers produce seeds. In autumn the whole plant dies and only the seeds survive the winter. Examples: daisies, dandelions, carrots.
      C. Perennials are plants that live for three or more years. Although they produce seeds, the parent plants survive the winter in various ways.
         1. Herbaceous or non-woody perennials survive in two main ways:
            a. With only the root surviving and putting up new leaves, stems, and flowers each Spring.
            b. With special types of underground stems surviving, and these putting out new roots, leaves, stems, and flowers each spring. Examples: daffodils, tulips, sweet potatoes.
         2. Woody perennials are of two different types:
            a. Some are deciduous, which means that they lose their leaves each fall.

2. Classroom activities:
   A. A bulletin board of pictures and/or a table top with potted plants can be made by the students to show: "These plants are Annuals," "These plants are Biennials," and "These plants are Perennials."
   B. A bulletin board could be labled something like "Our Changing Leaves." Then have each student find and choose a tree of "his own." With the help of field guides, he can identify this tree and add its name and location, and his name to the top of the bulletin board. Then periodically you can have the students bring in one leaf from their tree and put it on a date line on the bulletin board. If you start this early enough to assure that all the leaves will be green, and then continue the collection through the fall, students will have an opportunity to compare the color variences from tree to tree and the varying time schedules for their color change. You could even have some evergreen needles to show that some stay green.
   C. Have the class look for examples of the three types of plants in the school neighborhood. Dig up a dandelion to see how the root stores food for the winter. Compare it with the roots of grass or of an annual.

3. Vocabulary:

Annual	Adapt	Seed	Needle Leaf
Biennial	Environment	Germinate	Deciduous
Perennial	Season	Evergreen	Herbaceous
		Dormant	

O.E.E.C. Activity

This activity will begin with a quick review of the concepts that were covered in the classroom introduction. The rest of the time will be spent hiking through the woods and fields of the O.E.E.C.

Each group will look for signs of plant reaction to seasonal change, and for examples of annual, biennial, and perennial plants. They will find and examine:

1. Many varied and different fruits and seeds. (This will also fit in with another lesson from this session at the O.E.E.C.)
2. Assorted leaves on the ground from many trees and bushes.
3. Smaller weeds and other herbaceous annual plants dying off.
4. First and second year biennials, like Burdock.
5. Dead leaves of bulb plants.
6. Needle leaves from the evergreens beneath the trees.
7. Cones from the many conifers.
8. The grass turning brown.
9. Some of the trees which have dropped their leaves may have new leaf scars and buds.

(1). The leaves make food in late spring, summer, and early fall.
(2). More food is made than is needed for growth that year. The surplus is stored in the roots in the form of starch.
(3). In autumn, the leaves change color and fall off, Scientists do not fully understand all the processes that are involved in color change. Shorter days with less intense sunlight, and lower temperatures are probably influential.
(a). Jack Frost does not paint them. Some leaves change well before there is any frost.
(b). Yellow pigments are present in leaves throughout the growing season, but are masked by the green pigment chlorophyll. As the chlorophyll breaks down, the yellow is revealed.
(c). Bright orange or red colors are a result of other chemical changes.
(d). Leaves fall because a special layer of cells forms where the leaf stem is attached to the tree branch.
(i). This cuts off the veins that go into the leaf and makes it loose.
(ii). The new cell layer is also a protective scar which will be left on the branch.
(e). In the winter, trees are not dead. They are dormant or inactive.
(i). During this resting stage they cannot make any food.
(ii). They have stored food waiting in their roots.
(iii). The buds, which remain on the tree all winter, contain minature wrapped up leaves and flowers.
(f). Spring is the tree's growth season, when the increasing hours of daylight and higher temperatures cause the buds to open.

b. Some trees are evergreens, which means that they keep some of their leaves all year long, but they still behave in exactly the same way as deciduous trees.
(1). The long thin needle leaves of evergreens can better withstand the cold of winter. Many evergreens, however, lose approximately one seventh of their needles each fall.
(2). Evergreens are also rather dormant through the winter.
(3). Evergreen tree buds also wait for spring until they open into new leaves.

There are also some simple plants, such as mushrooms, molds, and other fungi, whose life spans are even shorter than one year. Many of these produce spores that remain dormant until conditions are right for them to grow into new plants.

Things that may be observed which relate to other activities of this session include:

1. Any animal with a backbone.
2. The forestation projects of previous years.
3. The several areas showing different stages of forest succession.
4. Examples of decaying plants and animals.

Classroom Follow-up

1. Write a report entitled: "What I saw happening to plants during our hike at the Outdoor Center."

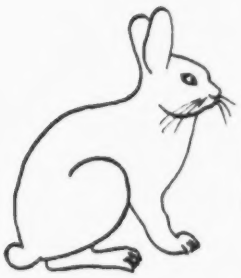
2. Many art lessons can be done utilizing colorful Autumn leaves. Here's one. Arrange the leaves in various patterns on a white or light colored background material like oil cloth. Then use a clear contact paper on top to make a place mat.

3. The Annual - Biennial - Perrenial bulletin board and/or table top display mentioned as an introductory activity could be expanded as a follow-up activity.

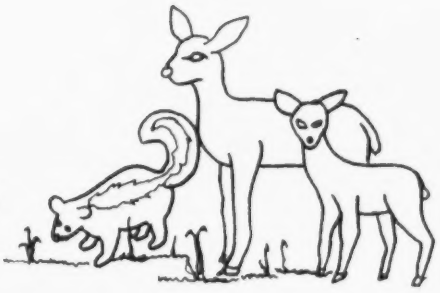
4. Another display might be entitled "Only This Part of These Plants Live Through Our Pennsylvania Winters." Then with a picture naming the entire plant, display that portion or object that does survive winter, such as seeds with asters, bulbs with tulips, roots with grasses or carrots, and a bare tree without its leaves.

5. Films from the district's film library that may relate to this activity include: "Plants Live Through The Winter," #1106, and "The Changing Forest- A First Film," #1245.

Fourth Grade
Early Spring



Mammals



Classroom Introduction

1. Start a bulletin board of pictures of mammals.

2. Raise mammals in your classroom. Mice, gerbils, guinea pigs, and hamsters make good classroom pets.

3. Take your classes to visit a zoo.

4. Send for copies of the pamphlet "25 Well Known Pennsylvania Mammals," published by the Pennsylvania Game Commission, P.O. Box 1567, Harrisburg 17120.

O.E.E.C. Activity

There are at least 15,000 kinds of Mammals in the world with about 350 different species inhabiting the United States. The objective of this activity is to show the students some live specimens and to use these subjects as a means of describing other mammals and the adaptions which make them different from each other and from other classes of animals.

I. Characteristics
   - A. Backbone (one of the five classes of vertebrate animals)
   - B. Warm-blooded (have a constant body temperature)
   - C. Hair or fur covering their skin
   - D. Young are born alive
   - E. Young are fed on milk from their mother. The term "mammal" is derived from the word "mammary," the milk gland of the mother.

II. Size
   - A. Smallest - the Pigmy Shrew
     1. average weight: 1/14 ounce
   - B. Largest - the Blue Whale
     1. weight: to 115 tons
     2. length: 80 - 100 feet

III. Special adaptions
- A. Teeth
  1. tusks of peccary
  2. gnawing teeth of rodents
  3. tearing teeth of meat eaters (cats, dogs)
  4. grinding teeth of plant eaters (cows, deer)
- B. Feet
  1. hoofs for kicking and running (deer, horses)
  2. pads for running (dogs, cats)
  3. Claws for digging, grasping and climbing
  4. webs for swimming (seals)
- C. Tails
  1. for balance (kangaroo)
  2. for support (monkey)
- D. Horns for defense (cows, goats, rhinoceroses)
  1. bony core that grows bigger each year
  2. not shed
- E. Antlers for defense (deer, elk, moose)
  1. solid bony growths from skull
  2. shed each year
- F. Flight of Bats
  1. forelimbs modified to form wings
  2. unique sonar-like system for navigating and catching insects at night
- G. Marine mammals (whales, porpoises and dolphins)
  1. breathe air ("blowing" of whale is breathing)
  2. skeleton cannot support the animal on land
  3. mothers nurse young like other mammals
- H. Pouched marsupials (opossum and kangaroo)
  1. young born incompletely developed
  2. baby opossums live in mother's furlined pouch for 3 months
- I. "Flying" squirrels
  1. do not fly, but glide
  2. have loose fold of skin between front and rear legs
- J. Porcupine quills
  1. actually modified hairs
  2. cannot shoot them
  3. loosely attached on back and tail
- K. Some mammals hibernate
  1. bears
  2. groundhogs

IV. Domestication by man
- A. Work animals
  1. dogs (seeing eye dogs, sled dogs, sheep dogs)
  2. horses
  3. oxen
- B. Food animals
  1. cows
  2. sheep
  3. pigs
- C. By-products
  1. leather

2. wool
3. cat gut
4. furs

V. Importance to man
A. Pioneers depended on game mammals for food
B. Fur trade accounted for exploration of New World
C. Fur farming today is big business
1. mink
2. nutria
3. chinchilla
D. Hunting is a big sport and business
1. small game
a. squirrels
b. rabbits
2. bear
3. deer
E. Moles, voles and ground squirrels help make soil
F. Mammals contribute to food chains both as predator (cats, coyotes, wolves) and as prey (rabbits, mice, rats)
G. Interesting photographic subjects
H. Mammal track collecting is a fun hobby
I. Many mammals make good pets
J. Riding and racing of mammals for recreation and sport

VI. Conservation
A. Wild mammals must be preserved in refuges
B. Habitat of endangered species must be preserved
C. National forests, national parks, state game refuges, and wilderness areas must be enlarged
D. Hunting laws must be enforced
E. Hunting and trapping must be regulated correctly
F. Importation and trade in furs of endangered species must be stopped
G. Fake furs should replace real mammal furs
H. Sales of tusks, ivory and bone products from mammals should be banned

Classroom Follow-up

1. Discuss the characteristics of mammals.

2. Discuss the five main characteristics of mammals and how they apply to man.

3. Find out which mammals are on the endangered species list.

4. Films about mammals from the Harrisburg City Schools film library:
"Mammals of Africa And India," #1246
"Monkeys And Apes- An Introduction To The Primates," #1006

5. Bibliography:

1. "Mammals, a Guide to Familiar American Sepcies," by Herbert S. Zim and Donald F. Hoffmeister, illustrated by James Gordon Irving, A Golden Nature Guide, Golden Press, New York.
2. "The How And Why Wonder Book of Prehistoric Mammals," by Martin L. Keen, illustrated by Johh Hull, Grosset and Dunlap, New York.
3. "The Mammal Guide," Mammals of North America North of Mexico, by Ralph S. Palmer, Doubleday and Company, Inc., Garden City, New York.
4. "Mammals of Pennsylvania," by J. Kenneth Doutt, Caroline A. Heppenstall and John E. Guilday, The Pennsylvania Game Commission, Harrisburg, Pennsylvania.

Classroom Introduction

1. Have each student hand in a list of "bugs" that they have seen. Save these until after the OEEC experience.

2. Raise mealworms so that students can observe the life cycle of an insect.

3. Buy a can of lobster, crab or shrimp and let the students taste some. Use a map to show where these arthropods are caught commercially.

4. Have students catch spiders at home. Put them in a jar with some sticks and observe the type of webs they build, if any. Don't forget to feed them live insects if you keep them more than a few days.

5. Set up a dead spider under a dissecting scope, or let the students observe a live one with a magnifying glass.

O.E.E.C. Activity

Children tend to call anything that is "creepy and crawly" a "bug." During this activity we will attempt to give the students a clear idea of what these creatures really are, and how they are classified by scientists. The phylum Arthropoda, the "joint-footed" animals, contains most of the known types of animals in the world. Many of the species are enormously abundant as individuals. We will examine specimens, both alive and preserved, with hand lenses and microscopes, and will introduce some of the similarities and diversities within this fascinating group of animals.

I. Arthropods, the "joint-footed" animals.
   A. Characteristics
      1. No backbone.
      2. Segmented (sectioned) body.
      3. Jointed legs.
      4. An external skeleton (hard shell).
   B. Habitats

1. Arthropods are adapted to every kind of habitat: air; land; soil; and fresh, brackish and salt waters.
2. They are found from mountains over 20,000 feet high to more than 18,000 feet depths of the ocean.

C. Ecological importance
1. Small crustaceans are vital links in water food chains.
2. Insects and spiders are important in land food chains.
3. Larger crustacea (shrimps, crabs, and lobsters) are eaten by man.
4. Insects are man's chief competitors for his crops.
5. Some insects and ticks carry diseases to man, crops and other animals.

II. Arthropods are grouped into five classes.

A. Crustaceans
1. Body characteristics
   a. two pairs of antennae
   b. head and thorax segments fused into one (the cephalothorax)
2. Growth and reproduction
   a. grow through a series of molts
   b. reproduce by means of eggs
3. Habitat
   a. mostly marine, but some live in inland waters or in moist places on land
4. Common types: lobsters; crabs; crayfish; shrimp; barnacles; sow bugs; water fleas.

B. Insects
1. Body characteristics
   a. three body parts, head, thorax and abdomen
   b. three pairs of legs on the thorax
   c. one pair of antennae
   d. usually one or two pairs of wings as adults
   e. respire through a series of tubes running throughout the body
2. Growth and reproduction - three types
   a. direct development (no metamorphosis)
      1. eggs hatch into miniatures of adult
      2. nymph molts and grows larger
      3. adult wingless. Example: silverfish
   b. gradual development (incomplete metamorphosis)
      1. egg hatches into nymph
      2. nymph molts as wings develop
      3. adult has full wings. Example: grasshopper
   c. complex development (complete metamorphosis)
      1. egg hatches into larva (a worm-like creature)
      2. larva grows and molts
      3. goes into pupal, or resting stage, inside a plant, underground, or in a special case
      4. adults emerge from pupal stage with wings and ability to reproduce. Examples: honeybees; butterflies.

3. Habitat
    a. most abundant and widespread of all land animals. There are over half a million different kinds known
    b. live in all habitats except the sea.
4. Common types: grasshoppers; praying mantis; cock-roaches; dragon flies; termites; aphids; lady bugs; beetles; moths; butterflies; ants; bees; wasps; flies and mosquitos

C. Arachnids
1. Body characteristics
    a. have a cephalothorax with eight legs on it
    b. many can produce silk from special abdominal glands
    c. respire by means of tubes running through the body, or by book lungs
2. Growth and reproduction
    a. grow by a series of molts
    b. reproduce by means of eggs
3. Habitat
    a. most live on land
    b. the horse-shoe crab is marine
4. Common types: spiders; mites; ticks; daddy-long legs; horse-shoe crabs; scorpions
5. Spiders: the most common arachnid
    a. over 20,000 species are known
    b. they live from sea level to the highest mountains
    c. feed mainly on insects
    d. many catch their prey by means of webs which they spin with silk secreted from abdominal glands
    e. poison bearing fangs kill the prey and the poison reduces its contents to liquid which is then sucked out
    f. the bite of a few spiders is dangerous to man - the following appear in the U.S.
        1. the black widow
        2. the brown recluse
        3. the tarantula- this bite is more painful than dangerous

D. Centipedes- hundred leggers
1. Body characteristics
    a. 15 to 173 body segments
    b. have one leg pair on each body segment except the first
    c. one pair of antennae
2. Growth and reproduction
    a. grow by a series of molts
    b. reproduce by means of eggs
3. Habitat
    a. most live in warm countries
    b. hide by day under stones or logs and run about at night to capture prey by means of poison claws
4. Common types: A few small kinds are found in Pennsylvania, the most common is the House Centipede, which

eats insects and is harmless to man

E. Millipedes- thousand leggers
   1. Body characteristics
      a. 24 to more than 100 body segments
      b. have two pairs of legs on each of body segments except the first four
      c. one pair of antennae
   2. Growth and reproduction
      a. grow by a series of molts
      b. reproduce by means of eggs
   3. Habitat
      a. live in dark, damp places under stones or in rotten logs
      b. eat mostly dead plant materials
   4. Common types: some small millipedes are found in Pennsylvania

Classroom Follow-up

1. Pass out the lists of "bugs" made before the OEEC experience and discuss which are insects and which are other arthropods.

2. Review the characteristics of insects. Compare them to spiders and other arthropods.

3. Start an ant colony for the class. Discuss ant and bee society and ask your students opinions about people adapting to that way of life.

4. Have the class divide into five groups and have each group write an "autobiography" of one type of arthropod.

5. Vocabulary:

arthropods	arachnid	abdomen
habitat	centipede	cephalothorax
crustacean	millipede	metamorphosis
insect	thorax	antennae
respire	book lung	

6. Films from the Harrisburg City Schools film library dealing with Arthropods are:
"Insect Metamorphisis," #286
"Spiders- Backyard Science," #278
"Ants- Backyard Science," #1009
"Bees- Backyard Science," #1010
"Beetles- Backyard Science," #1011
"The Big Green Caterpillar," #1012
"Crickets- Backyard Science," #1013
"Insects- A First Film," #1014
"Butterfly," #1029
"Butterfly Behavior-An Investigation," #1030

ENEMIES of the forest

Classroom Introduction

The worst enemy of the forest, of course, is man. Man is responsible for nine out of every ten forest fires. Man initially imported many of the tree blights into this country. Man cut down the immense, irreplaceable stands of virgin timber and replaced them with second and third growth trees. Man lets his livestock graze in the forests and trample seedlings. Man turned forest lands into farms. Man's poor construction practices causes the majority of water erosion. Man finds it necessary to utilize the forest for his own commercial purposes. Man chooses to geometrically increase his population resulting in an increased consumer demand for wood, paper and wood products. Man claims that conservation means the wise use of natural resources such as forests, and then blindly bungles forest management in the name of conservation. Man is the ultimate omnivorous, consummate, polluting predator of the forest and until he as a species becomes cognizant of that fact the forests must endure the constant threat of extinction.

1. With your students, make a list of all thc things which comprise the forest. Then discuss how each part relates to the other and how man can protect each and every one.

2. Discuss how man can interrupt natural forest succession.

O.E.E.C. Activity

I. Fire
   - A. Nine out of every ten forest fires are started by people.
     1. some people are careless, some indifferent
     2. campfires spread accidently
     3. smokers drop matches, or lit cigarettes or ashes
     4. trash fires sometimes get out of control
     5. some people set fires on purpose
   - B. Forest fires can:
     1. consume trees
     2. kill wildlife
     3. kill people
     4. burn houses
     5. destroy animal homes

6. ruin the soil
7. cause wounds on trees through which disease enters
8. create enough ashes so that run off kills fish in nearby streams
9. result in rampant erosion so that nothing can grow on the spot again for many years
10. turn a once beautiful area into an ugly wasteland

C. The U. S. Forest Service estimates that over 50 million dollars worth of tax money is spent each year on forest fire control.

D. Things you can do to help prevent forest fires.
1. Be sure all matches are out.
   Break wooden matches in two.
   Put the match you used to start your campfire on the fire.
2. Never throw pipe ashes or cigarette and cigar butts away. Put them in an ashtray in a car. Put them in your pocket, when they are out, while in the woods.
3. Remove anything flammable from a ten foot diameter of the spot where you wish to build a campfire. Dig a hole in the center of the circle and in it build your fire.
   Keep your fire small
   Never build it against trees, logs or near brush
4. Never leave your fire until it is dead out.
5. To put a campfire out stir the coals while soaking them with water. Turn charred sticks and drench them on both sides.
   Wet the ground around the fire place
   Make sure every spark is out
6. Prevent air pollution and forest fires by never burning trash, grass, brush or garden cuttings.

II. Insects

A. Insects can cause damage in several ways:
1. Bark beetles dig a kind of tunnel between the bark of the tree and the wood inside. This severs water and food transportation within the tree.
2. Foilage eaters strip the trees of their leaves. This in a sense starves the tree to death since food is made in the leaves.
3. Some insects stunt and deform the tree as a result of damage to branches and tops.
4. Some bore into the trunk weakening the tree and leaving it open to infection.
5. Some decrease the vitality of trees by sucking their sap.

B. Control of insect plagues.
1. Removal of infested trees when necessary.
2. Spraying of insecticides.
   a. the decision to spray may mean the death of harmless species, the addition of poisons to the food chain, and eventual poisoning of man
   b. many insects build up immunities to sprays and so stronger and stronger pesticides must be used sometimes to no avail because the pests return.

3. Biological control, the use of insect predators or insect diseases to control the pest species.

C. Four insects which cause much damage in Pennsylvania are:
   1. The Gypsy Moth
   2. The Oak-leaf Roller
   3. The Tent Caterpillar
   4. The Dutch Elm Bark Beetle

III. Disease
   A. Fungi are the main source of disease in the forest
      1. Some kill trees.
      2. Some reduce the growth rate.
      3. Some destroy the heartwood.
   B. Examples of fungal diseases
      1. Chestnut blight
      2. White pine blister
      3. Heart rot fungi

IV. Grazing animals
   A. trample seedlings
   B. compact the soil
   C. break young trees
   D. eat the inner bark

V. Weather
   A. wind storms
   B. snow, sleet and ice
      1. Snow, however, also protects the soil and the young trees.
      2. Sometimes weather is a natural pruning device which actually strengthens the forest by destroying weak trees.

VI. Lumbering
   A. By definition a practice which elimates the forest in part.
   B. Obviously there is a necessity to combine the talents of science and industry to protect the living forest.

VII. Pollution
   A. Air pollution
      1. pollutants coat tree leaves blocking photosynthetic (food making) processes.
      2. trees absorb some damage causing pollutants
   B. Water pollution
      1. trees absorb poisonous pollutants through their roots
   C. Land pollution
      1. litter is unsightly
      2. litter can interfere with the lives of animals in the forest community

VIII. Construction
   A. Highways
      1. Cut straight swaths through the middle of forests.
      2. Allow pollutants like ozone and carbon dioxide to spread through the forest.
   B. Trees are cut down for:
      1. shopping centers
      2. parking lots
      3. summer cottages

4. housing developments
5. factories
6. other facilities to please, comfort, house and satiate multiplying humanity

Classroom Follow-up

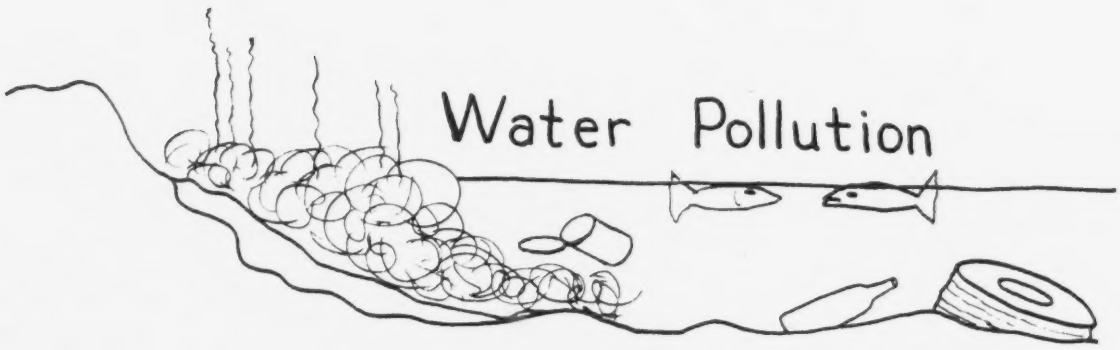
1. Send away for Smokey the Bear's "Junior Forest Ranger Handbook," by Glenn A. Kovar, U. S. Government Printing Office number O-365-879 for your students.

2. Send for "Enemies of the Forests," U. S. Forest Service Washington, D. C., U. S. Government Printing Office number GPO 902-295.

3. Films from the Harrisburg City Schools film library that may help with this lesson are:
"The Changing Forest A First Film," #1245
"How Sunshine Helps Us," #1116

4. Plan an Arbor Day program for your classes or a school assembly.

5. Plan a debate with one team taking the position that man is the greatest enemy of the forest, and the other side refuting that argument.



Classroom Introduction

1. Discuss how people need clean water for personal use everyday. We drink it, we wash in it, we clean our dishes, our floors and our cars with it, and we dump our body wastes into it. The flush toilet uses 5 gallons of water every time it is used. We also utilize water for swimming, boating, fishing and other forms of recreation, and for just plain looking at for its natural beauty.

2. What pollutes water?

   I. Fresh water.

      A. Septic tank effluent which leaks into ground water in limestone areas or runs directly into streams.

      B. Discharge from municipal sewage treatment plants, where the sewage wastes are often not made as pure as they should be before discharging back into the stream. Newer well designed ones don't do this.

      C. Laundry discharges. Many detergents don't break down during sewage treatment and so chemicals like phosphates enter fresh water. These compounds act like fertilizers for algae, which, when abundant, utilize more than their fair share of the oxygen in the water.

      D. Acid mine drainage. The result of the action of air, water and sulfur materials from coal mines.

      E. Littering. Aluminum cans + H_2O = Aluminum Oxide.

      F. Agricultural operations. Silt from erosion; pesticides from orchards and other crop areas; fertilizers that contain nitrogen and phosphates.

      G. Industrial wastes from places like paper mills, refineries, textile plants, chemical plants, and other factories.

H. Atomic power plants = thermal (heat) pollution.

II. The Oceans.

A. 70% of the Earths oxygen is made in the oceans by photosynthesis in single celled diatoms and other green marine plants.

B. Jocques Cousteau, world famous oceanologist, has said that 40% of the life in the ocean has been killed in the last 10 years.

C. Some ways the oceans are polluted:
1. Oil wells spring leaks, explode or whatever, killing numerous fish, countless waterfowl, and other sea life, and destroy estuaries, the genesis place of ocean life.
2. Whales were hunted till they are now nearly extinct.
3. Mercury dumped into rivers finds its way into the bodies of Tuna, Swordfish, and other species of sea life.
4. New York City has created an island of garbage by dumping trash from barges.
5. Tankers break up on reefs or collide causing oil spills.
6. The U.S. military dumps poison gases into the oceans.
7. Radioactive wastes are dumped at sea.
8. Smog gets rained down upon the ocean.
9. Every polluted river in the world empties into the oceans.

3. Vocabulary:

Effluent	Estuaries	Detergent	Pesticide
Discharge	Sewage	Phosphates	Fertilizers
Silt	Aquatic	Algae	Thermal
Contaminated	Oil Slick	Drainage	Biodegradable

O.E.E.C. Activity

I. What happens when water is polluted?

A. It becomes undrinkable for men or animals, because it now contains toxic poisons or pathogenic bacteria.

B. The balance of nature is upset.
1. The life cycle may be cut somewhere causing an overabundance of one species. This has happened in Spring Creek, which runs through the O.E.E.C., so that it has an over population of scavenge animals, such as crayfish and carp.

2. This may eventually result in simplified eco-systems and finally death of the entire cycle, if the pollution continues.

C. Fish kills, due to:
   1. Toxic poisons.
   2. Bacteria or other agents of fish diseases.
   3. Suffocation. Many pollutants consume the dissolved oxygen from the water leaving none for the aquatic organisms.

D. Streams age at a faster rate (eutrophication).
   1. Heated water increases the growth of algae which chokes the stream, cuts the oxygen supply and causes mass deaths of stream populations.
   2. Fertilizers often produce the same effects.

E. More and more beaches in Pennsylvania are closed every summer by the Health Department because the water isn't clean enough to be safe to swim in.

F. When oil covers water the small animals that live under it can't get through to the air above, many young animals in estuaries are killed by it. Often water birds die because, when their feathers get heavy oil on them, they can't fly.

G. Acid water from mine drainage can kill all the living things in the water.

H. Polluted rivers, streams, bays and lakes often look ugly and smell terrible. But not always, sometimes highly contaminated water looks very clean.

I. Dams may be a form of pollution.
   1. Silt clogs up behind the dam, limiting the amount of resilting down stream, e.g. The Aswan Dam in Egypt.
   2. They stop the natural spawning habits of some fish, Salmon for example, unless special fish ladders are built in.
   3. They change the ecology, both aquatic and terrestrial, up stream and down.

II. Spring Creek at the O.E.E.C. is a perfect example of a polluted stream and the problems involved in cleaning it up.

A. Why is Spring Creek polluted?
   1. Over flow from undersized sewer mains adjacent to the creek allows discharge of raw sewage directly into the creek. This condition is

worse sometimes then at others.
2. Swimming pool wastes.
3. Septic tank leakage.
4. Littering and dumping (to a lesser extent).

B. In the Spring of 1970 all the fourth grade students wrote letters to pollution control, health, and fish commission officials. Four people visited the O.E.E.C. to look at Spring Creek. We found the answer to the pollution problems is a new $2 million sewage collection system. This new plant is only being talked about at present.
   1. More funding grants to muncipalities are needed.

C. The Harrisburg School District's health services have requested that we do not use the stream for any in-water aquatic studies.

D. Instructors will take part of this period to observe Spring Creek.

Classroom Follow-up

1. Review the O.E.E.C. lesson plan.

2. Discuss how water pollution influences everybody, and what everybody can do about it.

   A. Make sure your tax money isn't wasted.

   B. Join conservation organizations.

   C. Report cases of pollution to the Pennsylvania Fish Commission, if you can prove a fish kill, or pollution control departments of local or state governments.

   D. Don't litter, most of it washes into water.

   E. Use white paper at home. Some dyes pollute.

   F. Plant trees and grass, etc., to stop erosion.

   G. Talk alot about pollution to everybody.

   H. Write letters to government officials like senators and representatives, and ask them to vote money for pollution control.

   I. Write complaint letters to companies suspected of polluting, and thank you letters to those that are not causing any pollution.

J. Buy detergents that are biodegradeable, i.e., are broken down by the usual sewage treatment procedure, and that don't contain any phosphates.

K. Repair leaky faucets in order to help save our supplies of good water.

L. Use poisonous sprays only when absolutely necessary and then spray carefully.

3. Students could cut out and post pictures on a bulletin board of examples of water pollution.

4. Discuss the effects of pollution on the economy.

   A. Tax money is used to clean the water before it can be given back to nature.
      1. Many sewage treatment plants don't make the water clean enough.
      2. Should we spend more tax money to make them better?

   B. Industries that purify their waste rather than pollute our rivers and streams may have to charge more for their products.

5. A classroom project which may be science and social studies oriented could be a study of the Susquehanna River from New York State to the Chesepeake Bay. Study its watershed, pollution problems, i.e., industrial wastes, sewage, and mine drainage, and its recreational value. Each classroom could take one aspect of the project and contribute to a grade-wide collection to be placed in the school library.

6. A series of slides with a script on the water supply and sewer system of Harrisburg has been prepared by a staff member of the O.E.E.C. It is available to any teacher on request. It answers the following questions, and may be used as a basis for discussion and further research:
   a. Where does the city of Harrisburg get its drinking water? Where is it treated?
   b. Where does the sewage from Harrisburg go? How is it treated?
   c. What is a storm sewer? In Harrisburg where does the water from storm sewers go? What kinds of pollution does it carry?

7. Booklets, brochures, and information you can send for: The Sanitary Water Board of Pennsylvania prints many booklets concerning water pollution. Write to them for information. A good booklet is: "People And Water." Their address is P. O. Box 90, Harrisburg, Pennsylvania. 17120.

   Clean Streams Unlimited, 1718 N Second Street, Harrisburg Pennsylvania 17102 also distributes information about water pollution. One brochure you can write for is

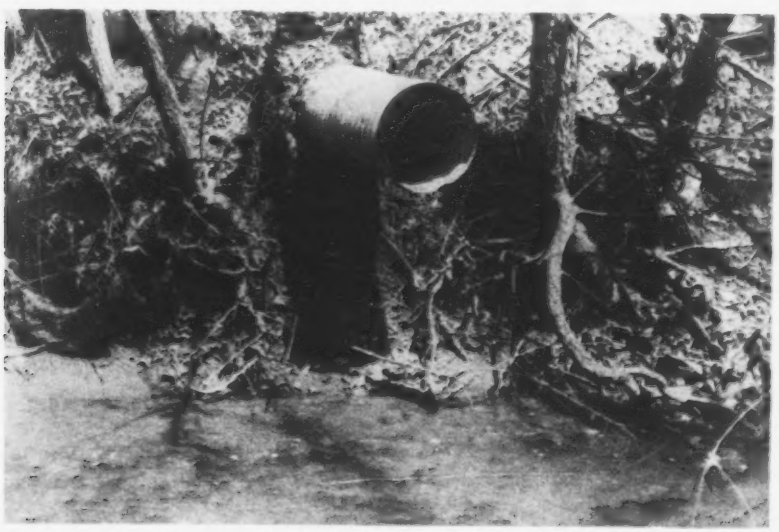
"Dead Fish! They Tell You Something?"

The Pennsylvania Fish Commission at, 3534 Walnut Street, Harrisburg, Pennsylvania 17109 has much information available concerning this problem.

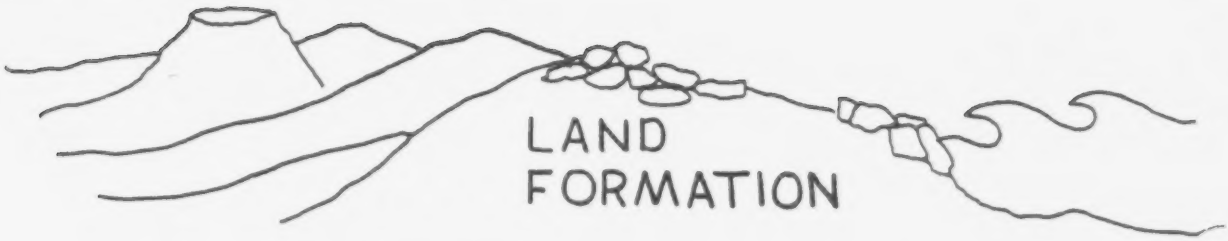
8. Films from the district's film library that may relate to this subject are:

"Water Pollution- A First Film"
"Water- A First Film"
"Water And Life"
"The River- A First Film"
"Water For The City"
"Cities And Utilities- Our Public Utility System"
"We Explore The Streams"
"Conservation Waterfall"
"The Ocean- A First Film"
"What's Under The Ocean"
"Oceanography- Science Of The Sea"
"Adaption To Ocean Environment"

9. Remind your students of the dates and times of TV specials that may deal with this subject. Two you should look for are Jocques Cousteau and National Geographic Society specials.



Sewage overflow outlet. Spring Creek on the grounds of the OEEC.



Classroom Introduction

1. Decorate your classroom or a bulletin board with pictures of various landscapes and terraine, so students can get an appreciation of the different land formations on the earth.

2. Vocabulary:

Cinder	- a small burned rock
Contract	- become smaller due to cooling
Crust	- the outer layer of rock on the earth
Expand	- become larger due to heating
Erosion	- wearing away
Erupt	- to throw material up from the earth
Fault	- a crack in the earth's crust where rock has moved
Geyser	- a steam and hot water volcano
Lava	- molten rock from a volcano
Magma	- molten rock under the earth
Molten	- melted rock
Volcano	- an opening in the earth that throws out molten rock, steam, cinders, and gases.

O.E.E.C. Activity

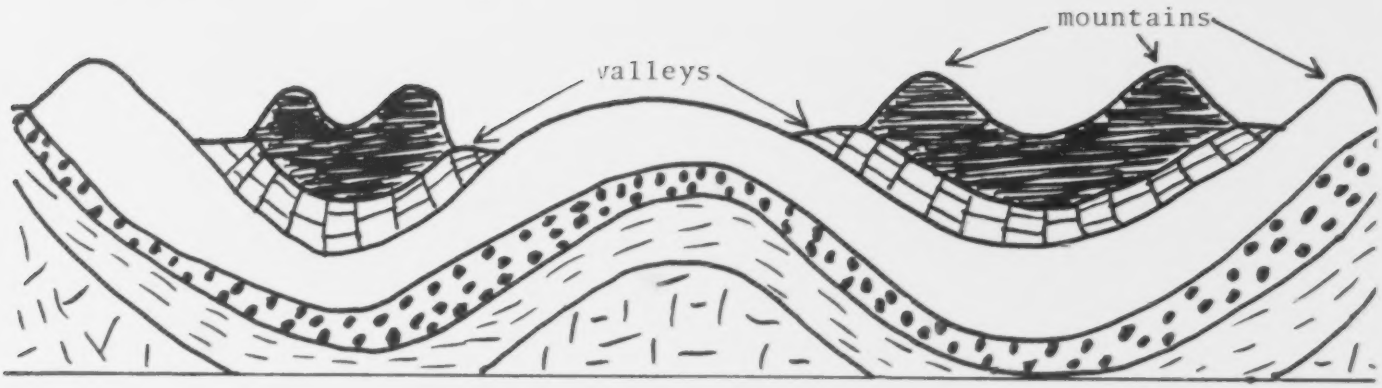
I. All of the differences in the formations on the surface of the earth were caused by two main forces: Orogeny or "building up", and Erosion or "tearing down". These two forces are constantly working to change the land surfaces around us, even today.

A. The "Building Up" Process

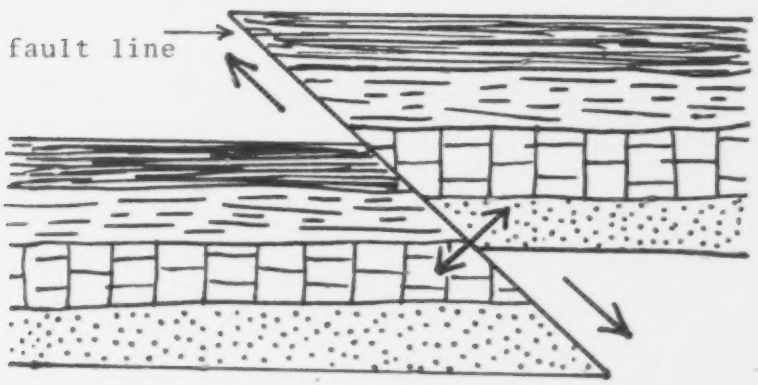
1. Folding

Horizontal stresses exerted on the earth's crust cause thick layers of rock to fold. Through millions of years, the soft layers of rock erode away and become valleys. The hard layers of rock, which resist erosion, become mountain chains. The

FOLDING

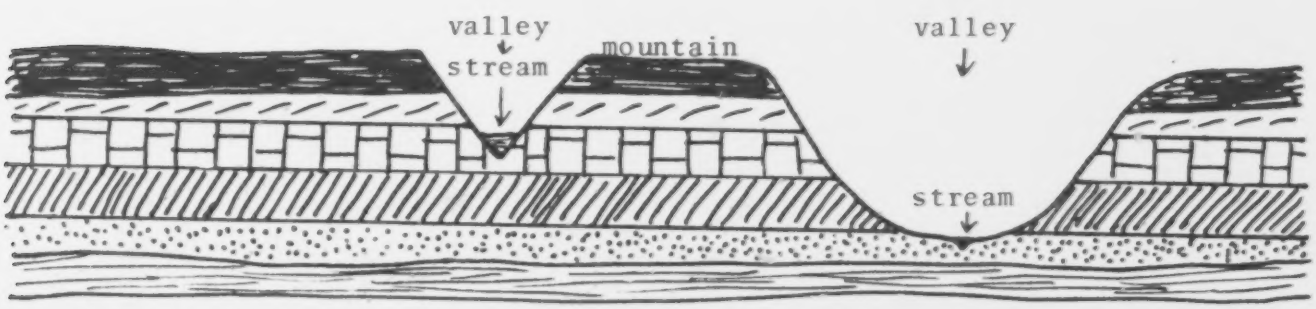


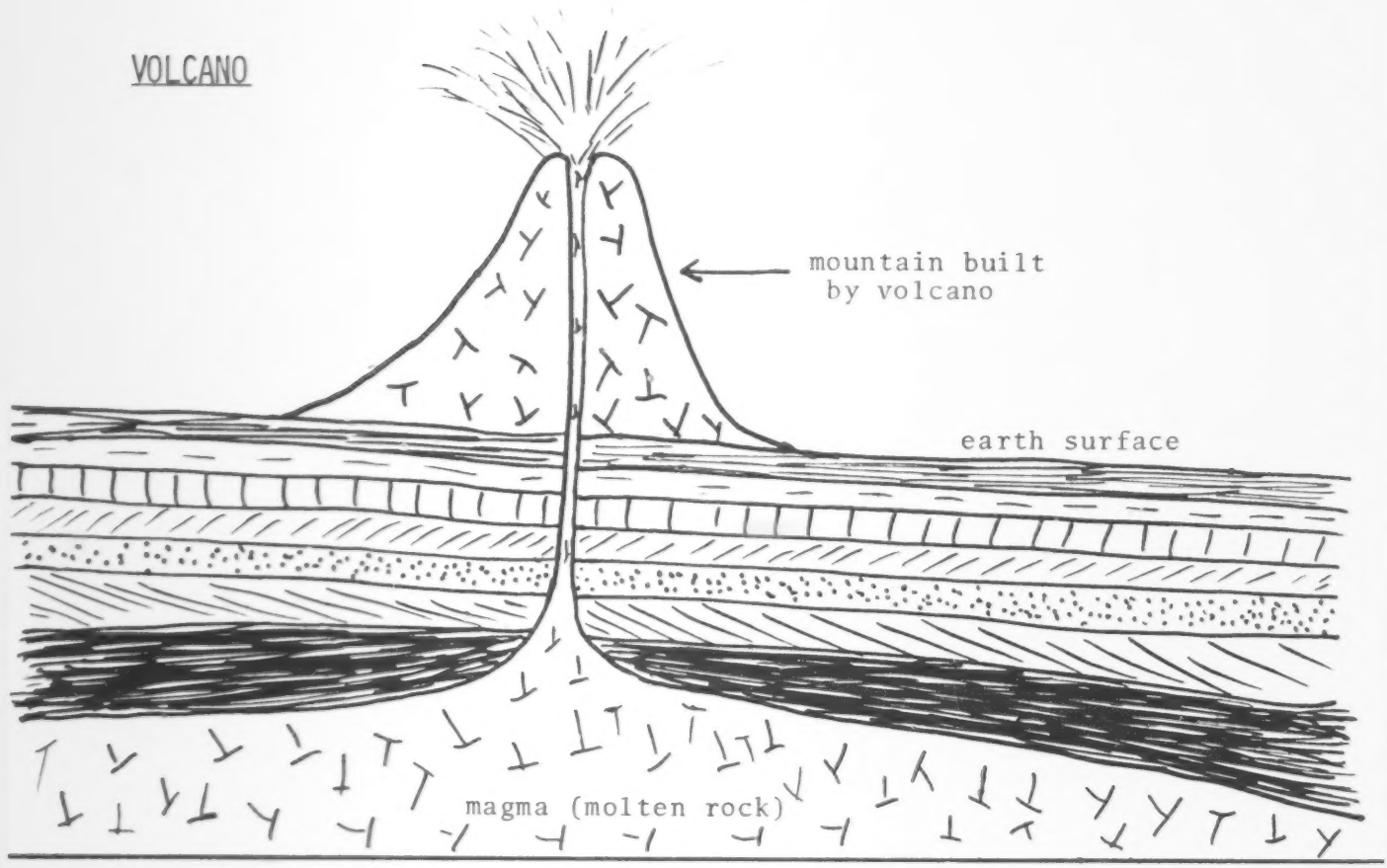
FAULTING

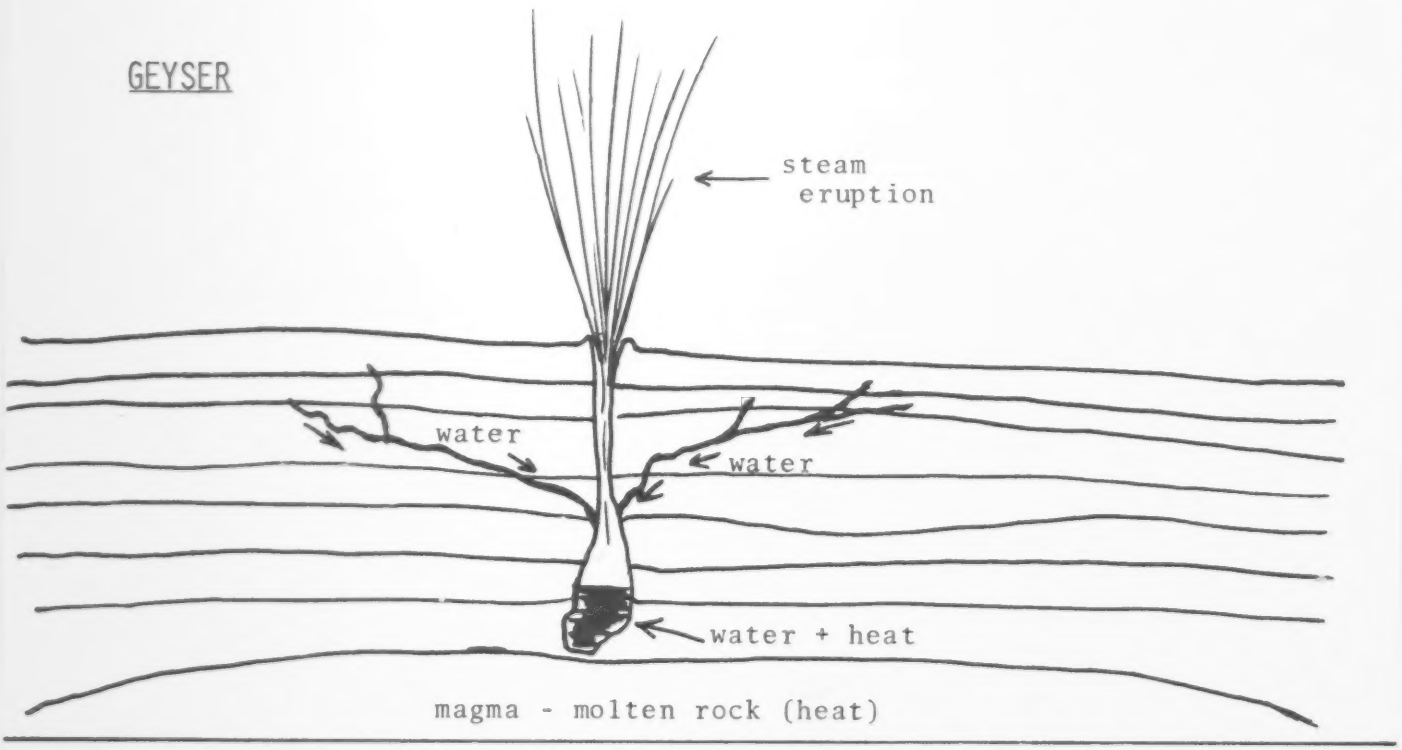


land may move horizontally or vertically along fault line

MECHANICAL EROSION (STREAM)




VOLCANO
mountain built by volcano
earth surface
magma (molten rock)


GEYSER
steam eruption
water
water
water + heat
magma - molten rock (heat)

Appalachian Mountains are perhaps the best example of folding and selective erosion. (See Diagram).
Example - The ends of a piece of paper can be pushed together to represent folding.

2. Faulting
Heat currents from deep within the earth cause tremendous stresses on the earth's crust. When the crust breaks and is forced upward (or downward), jagged mountains are formed such as the Rockies.
Example - Break a popsicle stick and discuss the result.

3. Volcanoes and Geysers(Vulcanism)
Deep inside the earth the rock can be hot enough to melt. When it does it is called magma. Magma becomes mixed with gases and can exert great pressure against the underside of the earth's crust. If this occurs where the crust is weak, the mixture of gas and magma breaks through and erupts on the surface in the form of lava. Hot lava and cinders will cool off and form a cone around the opening that grows each time the volcano erupts. In the end, it becomes a volcanic mountain.
Geysers occur when hot magma is formed beneath underground water. Instead of rock, steam breaks the surface.
Example - Shake a carbonated soda and allow it to "erupt."

B. The "Tearing Down" Process: Erosion
1. Chemical Erosion
Rain mixes with Carbon Dioxide in the air and forms a mild acid similar to soda pop. Over long periods of time this acid rain can dissolve rock and move it. Chemical erosion takes place mostly in moist climates
Example - The worn down Appalachians, and caves.

2. Mechanical Erosion
a. Water Motion in streams and rivers can break-up rock and roll it for long distances. This can cause water-cut valleys such as the Susquehanna basin.
b. Wind-blown Sand can act as a sand-blaster and erode the sides of mountains.
c. Changes in Temperature can break up rock because rocks expand and contract at different rates. This type of erosion occurs in dry climates.
d. Freezing and Thawing of water among rocks can cause breaking up of mountain formations.
e. Glaciation in very cold areas, such as the tops of mountains where the amount of snowfall in a year can

exceed the amount of melting. Thick layers of ice can form which flow down the mountain sides. As the ice flows, it grinds away the rock and forms "U"-shaped valleys.

Classroom Follow-up

1. Have the students add other pictures of various land formations to the ones you already have posted. Then discuss the origin of the formations and the possible changes that are presently taking place. Geology is not a static subject.

2. Land Form Geology can be integrated with social studies by discussing the ways in which land formations can affect the economy of a given area.

3. Write stories about the day I was in a volcano or earth quake, or "If I were as old as the earth, what changes would I have experienced?"

4. Have the students examine the school ground for mini-examples of geologic change e.g.:
   a. Folding - where pressure on warm asphalt has caused small hollows and rises.
   b. Faulting - where tree roots have pushed the sidewalk up.
   c. Mechanical Erosion - where steps have been worn down by traffic of many feet over the years.
   d. Weathering - where water and ice have caused cracks to appear and widen in cement.
   e. Soil erosion - where rain and foot traffic may have caused a slope to lose soil.

5. Have the students discuss the land formation in the Harrisburg area.

6. Films from the District's film library which may relate to this subject are:
   "Birth And Death Of Mountains," #272
   "Caverns And Geysers," #273
   "Earthquakes And Volcanoes," #274
   "How We Know About The Ice Ages," #275
   "What's Inside The Earth," #276
   "Glacier Park Studies (3rd Ed.)," #2050
   "River Of Ice- Life Cycle Of A Glacier (2nd Ed.)," #198
   "Strata- The Earth's Changing Crust," #1003
   "Yellowstone- Our First National Park," #2184
   "Sand- The Desert In Motion," #191

SHELTERS

Classroom Introduction

1. Discuss the homes or shelters used by people in different parts of the world.

2. Collect pictures for a "Homes and Shelters" bulletin board.

3. Discuss the reasons why man needs to shelter himself.

4. Research the types of shelters used by the American pioneers.

5. Discuss animal homes and shelters.

6. Find out how many of your students have ever built a tree house, or a foxhole or any other kind of fort. If they have, ask them to tell the rest of the class about it. Discuss it. Was it big enough to sleep in? Could it hold more than one person? Would it have been strong enough to stay up in a windstorm? Could people have lived in it in the winter time?

7. If a student has been camping, ask him to tell the class about the shelter he stayed in.

O.E.E.C. Activity

Inside, the group will discuss shelters that could be used in the woods in an emergency situation. The instructor will pass out pictures of tents and shelters for the students to see.

The instructor will then explain to the students that they will be able to build their own shelter out of a poncho or two ponchoes snapped together.

He will describe the following styles of poncho shelters.

1. A pup tent with open ends.
2. A lean-to between trees.
3. A canopy effect with the hood tied to an overhanging limb.
4. A "trappers" tent with one corner tied or posted up and the other three pegged down.

Before they go outside the instructor will urge the students to experiment and try a shelter of their own design.

Outside, the instructor will divide each class into several small groups, and give each group one or two ponchoes. There will be a box of ropes of various lengths, a box of metal tent pegs, and some poles available for the students to use.

Each group will pick their own spot to put their shelter. When all the groups have completed their shelters, the instructor will call them together. They will then go from shelter to shelter with the builders of each explaining why they erected the one they did.

The instructor will ask for comments concerning each shelter, and then give his own critique.

When they are finished, all of the materials will be collected, the ponchoes will be folded, and everything will be returned to the equipment room before the class is excused.

Classroom Follow-up

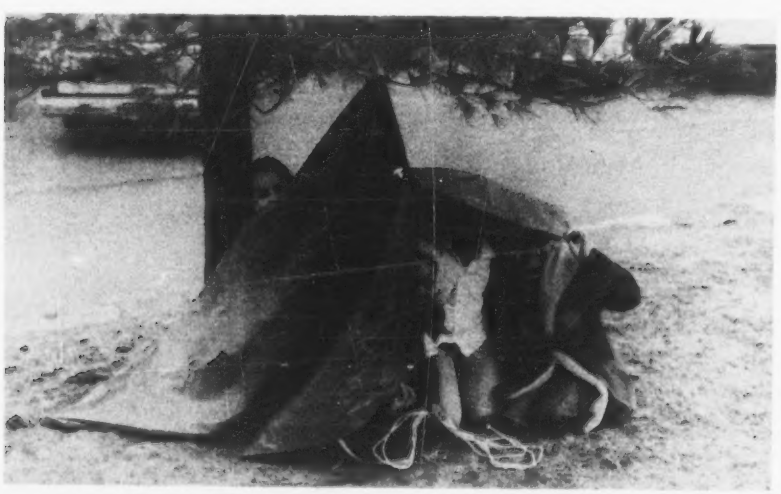
1. Take some students on an overnight camping trip.

2. Have your students draw pictures of a house or shelter they would like to live in, or visit, or spend a night in.

3. Vocabulary

Poncho	Den	Canvas	Burrow	Stake
Dwelling	Nest	Peg	Canopy	Lean-to

4. Harrisburg School District films that may relate to shelters are:
"The Fence," #149
"Birds- How They Live Where They Live," #1017



BAIT CASTING

Classroom Introduction

1. Send to the Fisherman's Information Bureau, 20 North Wacker Drive, Chicago, Illinois 60606 for materials about fishing. One informative pamphlet they publish is "How To Catch Fish In Fresh Water."

2. The Pennsylvania Fish Commission can supply you with much information about the sport of fishing. Some materials they publish are:
   "Pennsylvania Angler"
   "Fisherman's Guide to Pennsylvania Waters and Access Areas"
   "Summary of Fishing Regulations and Laws"
   "Fish Facts"
   "Identifying the Common Fishes of Pennsylvania"

3. Invite a representative of the Pennsylvania Fish Commission to speak to your classes or to a school assembly. Their mailing address is: Box 1673, Harrisburg, Pennsylvania 17120.

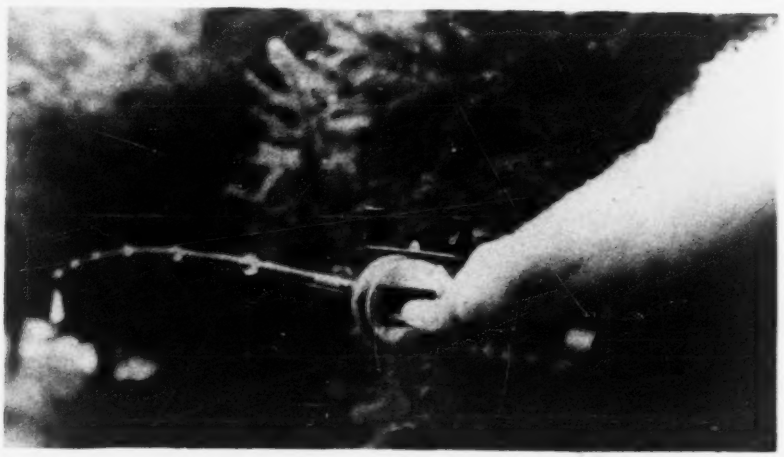
4. A film from the Harrisburg City Schools film library on fish is: "Fish Are Interesting," #1005

O.E.E.C. Activity

Objective:
To give every student an opportunity to practice casting a bait at a target or to a point in a pond or lake. The target in this case will be a plastic "hula hoop."

Demonstration:
A. The proper way to stand
   1. Feet spread a little less than shoulder width.
   2. Right foot forward a little, if right-handed. Left foot forward, if left-handed.

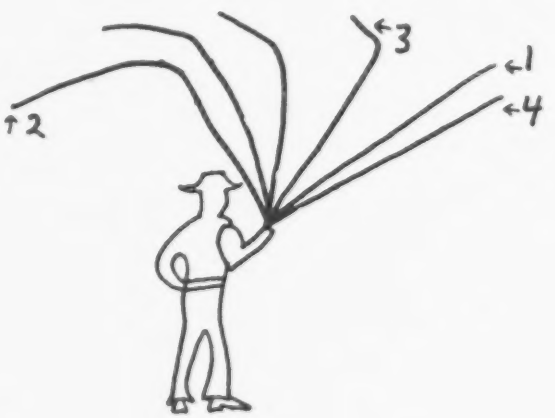
B. Holding the rod (refer to picture below).



Using the wrist and hand get the proper grip on the handle of the rod by turning the wrist over with the reel handle up, thumb on thumb button for maximum comfort and control.

C. How the rod works
1. Depress the thumb button to disengage the line.
2. Swing the rod back, then forward releasing the thumb button at the same time.
3. A little pressure on the thumb button will stop or control the cast.

D. Casting technique (refer to diagram).
At the starting position (1) the elbow and upper arm are close to, but not against, the body and the rod tip is pointed toward, though slightly above, the target. Lift the rod with a smooth, accelerating motion of the wrist. Stop the rod at approximately the vertical position allowing the momentum of the lure to flex the rod tip backward (2). Without hesitation, the cast is carried out through a quickly accelerated forward action of the wrist and forearm. The line is released (3) between the vertical and the starting position. Follow through by lowering the tip of the rod (4) to follow the flight of the lure.



Classroom Follow-up

GO FISHING !!!!!!!!

Classroom Introduction

1. Collect seed catalogues for the students to look through and discuss.

2. Collect pictures of garden vegetables and discuss which may be grown in this area, and which require a longer growing season.

O.E.E.C. Activity

Since many groups will be scheduled to visit the O.E.E.C. previous to the frost-free growing season in this area, the gardening activity will, necessarily, be of a preparatory nature.

GARDEN PREPARATION:

Groups will participate in the preparation of garden plots. Activities will include staking, spading, mulching, fertilizing and raking the soil as needed for various flowering plants and vegetables.

Staking - marking with wooden stakes and twine those areas to be prepared.

Spading - turning over the soil with hand tools like forked, short, and long handled spades.

Mulching - mixing with the soil decaying organic matter such as leaves, wood chips, or straw to retain moisture.

Fertilizing - spreading lime and/or chemical soil nutrients.

Raking - breaking up the clods of freshly spaded soil and smoothing out the soil for planting.

INDOOR ALTERNATIVE:

Groups will discuss the many activities necessary for successful gardening. In addition to the above mentioned procedures, planting plans can be made and various plants discussed.

Planters or flats, of tomatoes and other plants will be seeded and raised for transplanting at a later time.

Tools will be cared for as required. Cleaning, oiling and proper storage requires some attention. Safe carrying and handling will be stressed.

Classroom Follow-up

1. Visit a grocery store or farmers market to see the variety of fresh fruits and vegetables available. Many, of course, have to be shipped into our area from other regions. List them, record their prices and discuss the economic importance of gardens and gardening to man.

2. Start a small garden in flats in the back of the room, preferably near a window.

3. Vocabulary:

truck garden	commercial
crop	annual
produce	perrenial
harvest	preservation

4. Two Harrisburg School District films which may relate to this lesson are:
"Food For The City- Produce," #2003.
"How Does A Garden Grow," #1023.

Classroom Introduction

I. Background information

A. Seasonal change is an important influence upon the lives of animals. It affects how they look, where they go, what they do and what they eat. There are four main types of reaction by animals to seasonal change. They may:
   1. Migrate, or move to a new location.
   2. Hibernate, or find a place to hide and become inactive during the winter months.
   3. Lay eggs and die, leaving the next generation to hatch out after the inclement weather is over.
   4. Remain in the same locality, but change:
      a. food habits
      b. type of shelter
      c. color and/or thickness of their outer covering
      d. level and type of activity

B. Since this is a Spring class, we will be examining how animals react to the warmer, longer days and the new proliferation of plant and other animal life around them.
   1. Birds.
      a. Some are migrating here from the south and some of our winter birds are migrating to points north. Certain birds pass through during their migration, but don't become summer residents.
      b. Many are changing to their colorful mating plumage.
      c. The males are protecting the areas where they will nest and feed from males of the same species.
      d. Courting and nest building behaviors are much in eveidence at this time of year.
      e. Diet is changing to fresh buds, and insects.
   2. Mammals
      a. Some are becoming active after hibernation, or semi-hibernation.
      b. Many are losing their heavy winter coat.
      c. Courting and giving birth to young.
      d. Many are feasting on fresh buds and shoots and insects.
   3. Reptiles and amphibians
      a. Becoming active after hibernation.
      b. Calling of frogs and toads during courting is a common Spring sound.

c. Egg laying especially of amphibians in ponds and streams.

4. Insects and other arthropods
   a. Becoming active after hibernation.
   b. Hatching from eggs laid in the fall.
   c. Adults emerging from larval stages.
   d. Mating and laying eggs.
   e. Feeding on new vegetation and other insects.

II. Classroom Activity

A. Discuss with your class how animals react to the coming of Spring.

B. Have your class make observations of animal reaction to seasonal change in the city. Bird and insect activity are especially noticeable. Have them observe the reactions of man to the changes, also.

O.E.E.C. Activity

I. A hike will be taken to observe signs of Spring and animal reaction to it. Some of the things observed may be:

A. Birds
   1. Calls of summer residents such as the chickadee, cardinal, robin, song sparrow, chipping sparrow, and of migrants such as the white-throated sparrow and various warblers.
   2. Changes from winter to summer plummage are especially noticeable in starlings, and goldfinches.
   3. Nest-building activities.

B. Mammals
   1. Meadow mouse nests and runways.
   2. Signs of rabbits browsing.
   3. Raccoon or opossum tracks.
   4. Signs of muskrat activities around burrows.

C. Reptiles and amphibians
   1. Salamanders hiding under rocks.
   2. Frogs.
   3. Snakes.
   4. Frog and toad eggs and tadpoles.

D. Insects
   1. Swarming of various types of flies and bees.
   2. Pollinating activities of bees.
   3. Feeding activities of many types of insects.

Classroom Follow-up

1. Discuss with your class the types of animal reaction to seasonal change which they observed at the O.E.E.C. and compare it with what they have seen in the city.

2. Have the class discuss the advantages vs. the disadvantages of being cold-blooded, as far as seasonal change is concerned.